

## **Master Thesis**

“Value Relevance of Accounting Information: Emphasis on the Financial Crisis in  
2008”

By

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The Master Thesis is carried out as a part of the Master of Business Administration Program at  
the University of Agder. The University is not responsible for the methods used, results  
found and conclusions drawn.

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## **Acknowledgement**

The Master Thesis represents the end of my MSc in Business Administration at the University of Agder. The thesis is a mandatory part of the programme and correspond 30 credits. The main objective of a thesis is to apply scientific methods on a practical problem, and is intended to be related to the specialization within the study programme.

My choice of theme in this paper is based on my interest for and educational background in Financial Economics. This paper has given me the opportunity to apply scientific methodology within an area I consider as very interesting. It has been an educational process in learning the in-depth understanding of the theoretical literature and I am sure I will benefit from this knowledge in the future.

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## **Abstract**

Macroeconomic instability may increase the probability of default and accelerated to financial collapse, which consequently have an impact on value relevance of accounting information. The objective in this study is to enhance the understanding of value relevance in the Norwegian stock market with emphasis on which consequences the financial crisis in 2008 had on value relevance.

Given the considerable amount of value relevance research throughout time, it is impossible to adequately summarize the entire field, hence, this study presents a comprehensive review of the major areas in value relevance literature to give the reader an in-depth understanding. Empirical analysis is further applied where a test of general value relevance of accounting information is conducted. Regression analysis determines accounting information's ability to explain variations in the stock prices using data samples of Norwegian firms listed on the Oslo Stock Exchange Benchmark Index. The study further concerns variations in the explanatory power of accounting information during the crisis period.

Empirical analysis presents evidence confirming my prediction that accounting information denoted in earnings and equity book value are value relevant to investors in the Norwegian stock market. Regardless of which model specification applied, the variability in share prices are consistently better explained by equity book value relative to earnings. The overall results from investigating the value relevance of accounting information during the financial crisis in 2008, shows that the total value relevance has increased significantly, attributable to a substantial increase in the explanatory power of book value. This implies that investors valued accounting information higher during the crisis period. As predicted, results report a considerable increase in the explanatory power of book value and a decrease in the explanatory power of earnings.

Key words: Value relevance, earnings, equity book value, financial crisis.

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# 1 Introduction

The purpose of accounting information is to provide decision makers like investors, creditors and managers with information to support their decisions. The concept of value relevance originates from the work of Ball and Brown (1968) and Beaver (1968), investigating whether investor's availability on accounting information is useful information when taking investment decisions. The main objective of value relevance research is to examine whether there is a statistical relationship between financial statement variables and market variables.

The objective in this study is to enhance the understanding of value relevance and empirically investigate value relevance of accounting information for companies listed on the OSEBX (Oslo Stock Exchange Benchmark Index). Given various types of value relevance research methods, I limit my research to only emphasis on value relevance of earnings and equity book values. Motivated by previous studies and the lack of value relevance studies in Norway, this study will mainly focus on examining which consequences the financial crisis in 2008 had on the relationship between accounting information and the market values of firms in the Norwegian market. To some extent the crisis is still unfolding, therefore there is limited yet insightful empirical evidence addressing value relevance during the economy collapse. Researchers have investigated the association between financial health and value relevance where findings suggests mixed results (e.g., Graham, King, & Bailes, 2000; Davis-Friday & Gordon, 2005; Ibrahim et al., 2009). It is therefore very interesting to examine the impact on value relevance in the Norwegian market when instability in the macroeconomic environment appears. This lays the foundation for empirical research in this paper and formulates the problem for discussion as following:

*Is accounting information value relevant in the Norwegian stock market? What effects did the financial crisis in 2008 have on the value relevance?*

The study starts with a test of general value relevance of accounting information and its ability to explain stock prices in the Norwegian stock market using data samples from firms listed on the OSEBX in the period 2005-2008. My expectations are based on the considerable amount of research investigating value relevance of accounting information recognizing the existence of an association between market value and accounting information (e.g., Collins, Maydew, & Weiss, 1997; Francis & Schipper, 1999; Kothari, 2001; Gjerde, Knivsflå, & Sættem, 2007). As expected,

my empirical results are supportive to previous studies and suggest that accounting information reflected in earnings and equity book value are value relevant to investors in the Norwegian stock market.

The study further concerns variations in the explanatory power of accounting information during the financial crisis in 2008. Due to somewhat inconsistent prior findings, I expect that value relevance of equity book value increases during the crisis, while value relevance of earnings decreases. There are reasons for this: Researchers present evidence suggesting that if a liquidation effect dominates, the explanatory power of equity book value will increase (e.g., Barth, Beaver, & Landsman, 1998; Graham, King, & Bailes, 2000). This implies that when the financial health decreases, equity book value's ability to explain variations in market values increases while decreases for earnings. Consequently, shareholders become more likely to value a firm based on liquidation value rather than earnings potential (Graham, King, & Bailes, 2000). Statistical results confirm my prediction showing a significant increase in explanatory power of book value and a decrease in the explanatory power of earnings during the crisis, implying an inversely movement. Additional, my results suggest that accounting information reflected in earnings and equity book value are more value relevant during the financial crisis compared to the period before. As compared to earnings, explanatory power and incremental values suggest that equity book value is more valued by investors both before and during the financial crisis.

The reminder of the paper proceeds as follows. Section two provides theoretical background of value relevance literature and represents the research hypotheses. Section three contains the research method applied and data description. Section four present empirical results and section five contain concluding remarks.

## **2 Theoretical background**

Section 2.1 introduces the idea of value relevance literature and the role of accounting data information. Capital market research is a major area which makes it difficult to recognize value relevance in the financial literature. To give an overview of the value relevance research, the characteristics and a classification of the research area is also introduced in section 2.1. Given the vast amount of value relevance research, it is impossible to adequately summarize the entire field, however, section 2.2 represents some of the different perspectives in empirical research. The most common methods investigating value relevance of accounting information are presented in section 2.3 where the association between stock prices and earnings, and book values are reviewed more extensively. A review of previous research on value relevance and financial health is presented in section 2.4. Section 2.5 discusses whether earning's and book value's ability to explain market values has declined over time. Finally, the development of the hypotheses for empirical testing in this paper is represented in section 2.6.

### **2.1 The concept of value relevance literature**

Section 2.1.1 reviews different preferences towards accounting information and its usefulness to the investor, in addition definitions of value relevance are presented. Section 2.1.2 discusses the characteristics of value relevance studies and will give insight in the classification of research.

#### **2.1.1 Usefulness of accounting data**

If investors use conventional accounting data then they must find accounting information useful (Kam, 1990:167). The usefulness of accounting data is the essential idea in the concept of value relevance. Kam suggests three directions determining whether accounting data is useful. The first direction focuses on financial statements and determines whether sufficient information is disclosed. Kam concludes that the research on the adequacy of disclosure indicates a significant difference in financial disclosures among firms, implying that larger firms disclose more information. The second direction is to determine the effect on people's decision making. Past empirical findings indicate that investors consider nonfinancial factors more important in making investment decisions. The third and last direction is to determine the correlation between stock prices and accounting data, especially earnings. Kam concludes that an item has "information content" if it affects investor's belief on the security value and he further suggests an examination of the statistical dependency between the item and stock prices. This direction is the most

common used method in empirical value relevance research (e.g., Ohlson, 1995; Francis & Schipper, 1999; Aboody, Hughes, & Liu, 2002).

Accounting information plays a major role in purchases, sales and other financial processes of the business. The concept of value relevance originates from the idea whether investors availability on accounting information is useful information when taking investment decisions. Observations the last two decades indicate an increase of interest in connecting accounting numbers to market value. The main emphasis in value relevance literature is to empirically examine if financial statement variables can explain the variability in capital market variables. If there exists a relationship, measures are made to interpret how much of the variation in the dependent stock market variable are explained by the independent accounting variables (Beaver, 2002).

The definition of value relevance has been interpreted in a number of ways. Theil (1968) was one of the first value relevance researchers and defined information as a change of expectations in the outcome of an event. Within the context of his study, he claimed that a firm's financial statement is value relevant if it leads to a change in investors assessments of the probability distribution of future returns. Beaver (1968) supported this definition and added that a sufficiently large change should exist to induce a change in decision maker's behaviour (Grube, Joy, & Panton, 1979). Several researchers describe accounting information as value relevant if it significantly relates to equity market value (e.g., Ohlson, 1995; Barth, 2001; Beaver, 2002).

Earlier studies relate the value relevance of accounting information to investor's behaviour and the change in behaviour. More extensively and recent studies relate value relevance to firm value. Francis and Schipper (1999) stated that value relevance is the accounting information's ability to determine firm's value. Aboody, Hughes and Liu (2002) define the relationship between market values and financial numbers as the mapping from accounting information to "intrinsic value" which refers to the present value of expected future dividends additional on all available information. A recent study by Beisland (2009) supports these definitions and further states:

*"If there is no association between accounting numbers and company value, accounting information cannot be termed value relevant".*

This implies that value relevance research measures the usefulness of accounting information from the perspective of equity investors.

In a historical point of view, value relevance of accounting information is a rather modern concept. The term was first published by Miller and Modigliani (1966) where the earnings-only approach was introduced and characterized value as the present value of permanent future earnings. Miller and Modigliani focused on firm's capital structure and concluded firm value as unaffected by the financial structure. The focus from a firm valuation perspective to a value relevance perspective of accounting information developed shortly after. In 1968, Beaver published the first research of information content of annual earnings announcements. Approximately twenty years later Landsman (1986) adopts a balance sheet approach where the book value information is considered. Feltham and Ohlson (1995) based their work on previous literature and adopted the abnormal earnings approach which represents firm value as a linear function of book value of equity. These three valuation models of earnings, book value and abnormal earnings represent the heavy reliability in the value relevance literature. However, the concept became popular within capital market research in the early 1990s and expanded rapidly. Holthausen and Watts (2001) identified 62 value relevance studies where only three were published before 1990. The last ten years, a large number of papers have either expand the traditional model specifications or critically evaluated and discussed earlier empirical research to continuously improve value relevance literature (e.g., Holthausen & Watts, 2001; Beaver, 2002; Ohlson, 2009).

### **2.1.2 Classifications and characteristics of value relevance studies**

Holthausen and Watts (2001) classified value relevance studies into three categories. (1) *Relative association studies* that compare the relationship between stock market values and alternative bottom line measures. By using different bottom line accounting numbers, researchers tests for differences in the explanatory power  $R^2$  applying regression analysis. Accounting numbers with greater  $R^2$  are considered as more value relevant. The explanatory power  $R^2$  is the most common measurement of value relevance used among researchers and enables them to compare with similar studies to survey their own findings. (2) *Incremental association studies* examine whether the accounting number of interest is helpful in explaining value or return given other specified variables. Accounting information is value relevant if estimated regression coefficients are significantly different from zero. (3) *Marginal information content studies* represent the final classification and investigate if accounting information provides investors with additional

information. If a reaction appears in the market price, it is considered as value relevance evidence. This paper falls both into the relative association and incremental association category.

Beaver (2002) has introduced five perspectives in capital market research the ten past years. The perspectives represent research areas which have given great contribution to accounting knowledge. The five areas are market efficiency, Feltham-Ohlson modelling, value relevance, analysts behaviour and discretionary behaviour. Beaver characterise the two first areas as the fundamentals of understanding accounting in capital markets. The last three areas implicit introduce some form of accounting structure or individual behaviour. Beaver claims that the perspective of value relevance research in capital markets has two distinctive characteristics. The first characteristic represents the requirement of an in-depth knowledge within this area of research and the second characteristic is the issue of timeliness. The issue of timeliness presents value relevance research as level studies where market value at a point in time is treated as a function of a set of accounting variables, such as assets, liabilities, revenues, expenses, and net income. Unlike event study, level study does not take timeliness into consideration. Event study research primary considers the timing of information and examines the stock price reaction over short windows of time centred on announcement dates. While level studies identify drivers of value that may be reflected in price over a longer time period. Beaver further question why timeliness is not the key issue and concludes that researchers are interested in a variety of questions where the importance of timeliness is more or less a dimension of the researcher's problem for discussion. For instance, in the case of examining what type of accounting information is reflected in firm value, timeliness is of less importance, while investigating changes in value over a specific period of time, timeliness must be considered (Beaver, 2002). Ball and Brown (1968) illustrated earlier the importance of timeliness in empirical research. They briefly concluded that the content of an income statement was considerable useful. Empirical findings show that fifty percent of all the available information about a firm was captured in that year's income statement. At this point in time, Ball and Brown indicated that the value relevance of earnings information was high.

Francis and Schipper's (1999) suggested four possible alternative interpretations of value relevance. The first interpretation considers accounting information as leading stock prices by capturing intrinsic share values. The measurement of value relevance will then be the profits

generated from implementing accounting based trading rules. The second interpretation indicates that if the variables used in valuation models originate from financial statement information, the information is termed value relevant. The third interpretation is based on the statistical association between accounting information and market value where the main objective is to measure whether investors actually use the information in setting prices. Finally, the fourth interpretation is seen in a long window perspective where the correlation between accounting information and market values are statistically examined. Interpretation three and four are the most common used interpretations in value relevant research in recent studies (e.g., Kothari, 2001; Aboody, Hughes, & Liu, 2002; Dontoh, Radhkrishnan, & Ronen, 2004; El-Gazzar, Finn, & Tang, 2009).

## **2.2 Empirical research perspectives and evidence**

Section 2.2 contains a brief review of value relevance literature over time, published research and empirical evidence. Value relevance research represents several different perspectives and makes it difficult to recognize the most important areas. Section 2.2.1 – 2.2.4 will give a comprehensive review presenting some of the major areas within the field of value relevance. Further, these sections will discuss the foundation of value relevance research, standard-setting, accounting procedures and regulations, and market efficiency.

### **2.2.1 The foundation of value relevance research**

Ball and Brown (1968) defined value relevance research as the use of price or return data to identify value drivers that effect prices or returns on the market value of stocks. Researchers throughout history of empirical investigation have a common understanding that value relevance research empirically investigates the usefulness of accounting information to stock investors (e.g., Collins et.al, 1997; Barth, Beaver, & Landsman, 1998; Francis & Schipper, 1999; Chen, Chen, & Su, 2001; Gjerde et al., 2005). Researchers further claim that accounting information is denoted as value relevant if there is a statistical association between accounting information and market values of equity. Accounting information reflected in earnings and book equity are widely used in value relevance research because they are summary measures of the income statement and balance sheet. The initial objective in value relevance research is to measure how much of the variability in market values that is explained by accounting variables (Aboody and Hughes, & Liu, 2002). The traditional model specification in value relevance research is the model approach

developed by Ohlson (1995). The model measures the association between the dependent variable denoted as market value and independent variables reflected in earnings and book values:

$$MV_{it} = \beta_{0t} + \beta_{1t} BV_{it} + \beta_{2t} E_{it} + \varepsilon_{it},$$

where  $MV_{it}$  is the market value of firm  $i$  in year  $t$  in the fiscal year end,  $BV_{it}$  is the book value of equity per share of firm  $i$  at year end  $t$ , and  $E_{it}$  is the earnings in firm  $i$  at year end  $t$ . This model has been extended by several researchers resulting in a variety of model approaches. For instance, the model has been extended by adding cash flow, accruals or unrecognized assets into the model (e.g., Misund, Osmundsen, & Asche, 2005; Barth, Beaver, & Landsman, 1998).

Research investigating the relationship between capital markets and financial statements has grown rapidly with over 1000 published papers in leading academic accounting and finance journals in the past three decades (Kothari, 2001). The majority of empirical research and evidence is U.S. studies and have been published in journals such as *Journal of Accounting Research*, *Journal of Accounting & Economics* and *The Accounting Review*. These Journals have served as benchmarks in statistical research of value relevance. There are also other unpublished studies which aggregate the depth in empirical findings. For instance, an unpublished Norwegian study provided by Gjerde, Knivsflå, and Sættem (2005) concluded that the value relevance of earnings financial reporting for investors trading on the OSE (Oslo Stock Exchange) have increased significantly over the past four decades. These findings are inconsistent with a published study of Francis and Schipper (1999) indicating a decrease in the explanatory power of earnings information over time. Questions arise why the findings are characterized different. Is it due to sample differences, long or short window study, or is it explained by differences in the model specification? The following sections in this theoretical review will discuss and introduce different perspectives of empirical research and evidence over time.

### **2.2.2 Standard-setting**

Hayley and Whalen (1998) view standard setters as defining the accounting language used by managers to communicate with the firm's external stakeholders. They further claim that standard setting add value if they enable financial statements to capture the variability in a firm's financial position and performance in a reliable manner. In fulfilling this objective, standard setters are



expected to consider conflicts between the relevance and reliability of accounting information under alternative standards.

Dahmash, Durand and Watson (2009) define the role of value relevance in standard setting:

*“Value relevance research is designed to provide evidence to accounting standard setters that can update their prior beliefs about how accounting amounts are reflected in share prices and, thus, can be informative to their deliberations and accounting standards”.*

Holthausen and Watts (2001) critically evaluated a numerous of studies investigating the statistical relationship between stock market values and accounting information. Their initial objective was to discuss the inferences in value relevance study’s standard settings. They claimed that inferences are likely to be useful to standard setters only if the underlying theories are descriptive. Without descriptive theories to interpret the empirical associations, the value relevance literature’s associations have limited implications. Holthausen and Watts stated that several papers address the empirical relation between accounting numbers and stock market values without drawing standard setting inferences. Their evaluation of the value relevance literature suggest that alternative literature is important to standard setting. The alternative literature is important because it can identify factors that influence accounting standard setting which are not generally incorporated into value relevance studies. Theories of accounting and standard setting generally do not incorporate factors other than associations with equity value.

Shortly after the publication of Holthausen and Watts (2001) study, another view of the literature was introduced by Barth, Beaver and Landsman (2001). In contrast with the first conclusion, that value relevance research offers little or no insight of standard setting, Barth, Beaver and Landsman claimed that the value relevance literature provides large insight for standard setters and other non-academic constituents. This conclusion is build upon testing of relevance and reliability. However, they also remark that as financial markets expands and become more complex, accounting standards attempt to keep pace with these changes. Hence, it is a challenge for accounting research to make a substantive contribution in addressing questions relevant to standard setting.

### **2.2.3 Accounting procedures and regulation**

Cassidy (1976) questioned whether the accounting procedures had an effect on the market price and hence the utility of financial statements. He claimed that if the market “sees through” accounting procedures, the literature may have little practical significance for the stock market. Cassidy refers to three empirical studies from 1972 addressing accounting procedures where Archibald (1972), Ball (1972) and Kaplan and Roll (1972) came to similar conclusions that changes in accounting techniques only had a temporary effect. This indicates that whether firms try to manipulate accounting information it will not have a long term affect on the market prices. The findings may be a result of accounting regulation. IASB (International Accounting Standards Board), GAAP (Generally Accepted Accounting Principles) and FASB (Financial Accounting Standards Board) prevents firms to manipulate accounting information by setting accounting principles and accounting regulations. These organisations main objective is to enhance the usefulness of the financial reports and make it easier for investors to compare information across countries and industries, and thus more relevant (Leuz, 2003).

El-Gazzar et al. (2009) illustrates the effect of regulation through an empirical study, especially in the airline industry. The emergence of the airline industry from regulation to non-regulation market structure provides a unique opportunity to test the value relevance of accounting information. El-Gazzar et al. examines the value relevance of earnings and nonearning (book values) information and shows statistical evidence indicating that security prices are higher aligned with nonearning measurements in regulated markets than in deregulated markets. This can be explained by the high competitiveness in deregulated markets. Earnings measurements empirically show the opposite that earnings did not have a significant effect on the market value during regulated test periods. In deregulated times, the empirical evidence support the prediction that earnings is a significant variable in explaining the security prices.

### **2.2.4 Market efficiency**

Value relevance studies continuously employ regressions of stock prices or return as dependent variables and determine the explanatory power of the accounting variables as independent variables. Traditional studies within this context do not take market efficiency into consideration and implicit assume that the capital market is efficient in a semi strong form (Aboody, Hughes, & Liu, 2002). The efficient market hypothesis (EMH) suggests three common forms in the market

efficiency concept; the weak form, semi strong form and strong form (Madura and Fox, 2007:85). In a weak form, market values reflect all available information. The semi-strong form reflects all publicly available information and continuously includes new information. And the strong-form assumes that the market reflects all information including inside information. According to Scott (2006) efficiency is the information content of the disclosures, not their form that is valued by the market. If a market is inefficient, the stock prices and return will not reflect available information to the investor, and hence, the value relevance research would be useless. Aboody, Hughes and Liu (2001) addresses whether measures of value relevance are materially affected by market inefficiencies. They statistically examined the impact of market inefficiencies on the estimation of coefficients in value relevance regressions. They further applied this procedure to three major research areas represented as the value relevance of earnings and book values, residual income value estimates, and finally the value relevance of accruals and cash flows. Aboody, Hughes and Liu concluded that it is important to consider market inefficiency effects when drawing inferences in value relevance studies. The results provide strong evidence that value relevance regressions fail to pick up the price effect of information in accounting variables. Aboody, Hughes and Liu further suggest that in order to measure value relevance with respect to intrinsic value, stock price needs to be adjusted for predictable future price changes that may be driven by measurement error. They considered the market as inefficient if the stock prices measured the intrinsic value with error. In addition, results indicated that value relevance of earnings and book value by using adjusted stock prices three year ahead increased the coefficients by 90% on earnings and 82% on book value.

## **2.3 Types of value relevance research**

The literature represents a variety of studies but there are especially three types of studies attracting much attention (Aboody & Hughes, 2005): 1) the value relevance of earnings and book values, 2) the value relevance of residual income value estimates and 3) the value relevance of accruals and cash flows. This paper mainly emphasizes on the value relevance of earnings and book values and therefore a more complementary review of this type of study are discussed in section 2.3.1. A more brief review of the value relevance of residual income and the value relevance of cash flows and accruals is presented in section 2.3.2 and 2.3.3.

### **2.3.1 The value relevance of earnings and book values**

Earnings and book value of equity are considered as two summary measures of financial statements. The book value is considered as the “bottom line” number in the balance sheet and earnings is the “bottom line” number in the income statement (Penman, 2010:20). These accounting numbers have therefore been of great interest to value relevance researchers. The majority of studies are measurement studies using regression analysis as the main empirical research tool. Many researchers decompose the combined explanatory power of earnings and book values into three components (Collins et al., 1997): (1) the incremental explanatory power of earnings, (2) the incremental explanatory power of book values, and (3) the explanatory power common to both earnings and book values. The common component consider earnings and book values as substitutes for each other in explaining prices and they also function as complements by providing explanatory power incremental to one another.

#### **2.3.1.1 The value relevance of earnings**

Kam (1990) claimed that the income statement is the most important financial report since it reveals results of the operations in a firm. Ball and Brown (1968) stated early the great importance of income statements. Their empirical findings indicate that fifty percent of all available information about a firm is captured in the income statement. Several researchers throughout time have made supportive conclusions about the information content in earnings reports (e.g., Beaver, 1968; Collins, et.al, 1997; Lev & Zarowin, 1999).

Lev and Zarowin (1999) introduce two ways in measuring value relevance of accounting information, the measure of explanatory power  $R^2$  and the combined ERC (earnings response coefficient).  $R^2$  is a measure generated from the regression analysis and enables to interpret the degree of the association between stock returns and earnings. Combined ERC is defined as the sum of the slope coefficients of the level and change of earnings measuring the sensitivity of the stock price to earnings. This measure reflects the average change in the stock price associated with a dollar change in earnings. A low slope coefficient suggests that reported earnings are not particularly informative to investors. In contrast, a high slope coefficient indicates that a large stock price change is associated with reported earnings reflecting investor’s belief that earnings are long run earnings power of the firm (Lev & Zarowin, 1999).

There are two empirical regression models that are widely used among researchers; price regression and return regression (e.g., Francis & Schipper, 1999; Collins et al., 1999; Lev & Zarowin, 1999; Gjerde et al., 2005). Price regression represents the stock price as the dependent variable where earnings (often quoted in earnings per share (EPS)) are the independent variable. The alternative return regression is often applied in addition to price regression where abnormal stock return is denoted as the dependent variable, and the variability in the regression model is explained by the independent variable of unexpected earnings. In addition, some researchers estimate return regression where return received act as the dependent variable and earnings and change in earnings act as independent variables. This paper considers only price regressions. The technical description of empirical research design will be more complementary introduced in section 3.

Easton and Harris (1991) suggested that earnings are an explanatory variable for returns. To confirm the level of earnings and the variability in earnings explaining stock returns, they performed a multiple cross sectional regression of annual returns. Their findings show a significant coefficient on earnings in all 19 years, while the coefficient on the variability in earnings is significant in less than half the years. Studies investigating the relationship between abnormal returns and unexpected earnings might mitigate the effect of measurement errors by including both earnings level and earnings change variables as measures of unexpected earnings (Easton & Harris, 1991). They assumed in this setting that both earnings variables measure unexpected earnings with errors.

Change in the value relevance of earnings has been investigated in several studies. Collins, Maydew and Weiss (1997) performed an annually cross sectional regression over a 40 year period and concluded that the incremental value relevance of earnings declined over the time period 1953-93. Collins et al. explained the decline in earnings by a shift in value relevance from earnings to book value driven by increasing frequency of onetime items, increasing frequency of negative earnings, intangible development and increasing average firm size. Lev and Zarowin (1999) show supportive evidence of a declining association between reported earnings and stock return. Lev and Zarowin performed a cross sectional regression to measure the association between change in earnings and stock return over a 20 years's time period in the U.S. Their findings show decrease in the relationship between stock returns and earnings measured by  $R^2$  in

the 1977-96 period from 6-12% in the ten first years to 4-8% in the last ten years. They reported that earnings account for only 5% to 10% of the variation in stock returns in year by year intervals.

Kormendi and Lipe (1987) concluded earlier that poor return earnings association was due to a lack of earnings persistence. Their results suggest that stock returns are not excessively sensitive to earnings innovations. Easton and Harris (1991) claimed that prior research studies had a lack of a long term perspective. They empirically indicated that the issue of poor return earnings association might be an explanation of applying only short-run data. Empirical testing confirmed their hypothesis that the correlation between returns and earnings will increase using long term accounting data information. Their findings show a dramatic improvement in the return earnings association using long term intervals. An alternative explanation of the poor return earnings association is a matter of model specification, investigated by Beaver, McAnnally and Stinson (1997). They characterize the price earnings relation as a system of a simultaneous equation. In a price regression, the independent variable (earnings) and the dependent variable (price) can act as if they are both endogenously determined because they are affected by information which are explicitly difficult to specify. Beaver, McAnnally and Stinson provide evidence that changes in both the variables, price and earnings, are endogenous implying that a portion of the single equation bias can be mitigated via joint estimation.

Whether earnings management has an effect on the value relevance of accounting information is an issue discussed by Maquardt and Wiedman (2004). They examined firms releasing and not releasing earnings forecasts in a nine month period prior to the offering. They stated that managers have two advantages; the participation in secondary equity issues by selling shares of their own stock. The second advantage relates to manager's position in the firm which enables them to influence financial reporting. Empirical results show no evidence of significant earnings management and no decreased value relevance of earnings for firms releasing earnings forecasts. However, Maquardt and Wiedman findings show a decline in value relevance of earnings and additional a significance in earnings management for firms not releasing earnings forecasts.

Volume and trading may also influence the results of value relevance reflected in earnings. Beaver (1968) was the first researcher who investigated the issue of volume and trading activity. He predicted that if income statements have information content, the number of shares traded is

likely to be higher when the earnings report is released. Beaver tested the relationship between stock price and volume of trading and presented evidence that investors do look at reported earnings and do not use other variables to the exclusion of reported earnings. Cready and Myanatt (1991) also used annual report release dates to discuss whether trading activity is a measure of information content. The empirical research indicated no evidence of a price response and little evidence of a volume of shares response at annual report dates. However, the trading activity increased significantly four to five days after the annual report release date. These results suggest that annual earnings reports contain valuable information to investors. Consistent with Hakansson (1977), Cready and Myanatt (1991) also concluded that “small” investors rely on the public information system reflected in annual reports, while “large” investors rely more on predisclosure information in making investment decisions.

#### **2.3.1.2 The value relevance of book value**

Several research studies containing balance sheet components refer to the valuation model as the market value of equity equalling market value of assets minus market value of liabilities. This is labelled as the balance sheet model (Holthausen & Watts, 2001). Researchers usually apply price level regression to evaluate the value relevance of book value. The most common used method represent stock price as the dependent variable, and book value per share (BVS) as the independent variables. An alternative, quite similar, regression denotes market value as the dependent variable, while assets and liabilities are independent variables (Francis & Schipper, 1999). However, book value of equity has been confirmed in several studies as being highly associated with stock prices. In addition, the statistical association between stock prices and book equity is typically stronger relative to stock returns and earnings (e.g., Collins et al., 1997; Francis & Schipper, 1999; Lev & Zarowin, 1999; Gjerde et al., 2007).

Berk and DeMarzo (2007:24) stated that book value of equity is an inaccurate assessment of the actual value of the firm’s equity. They stated that market value of a stock is independent on the historical cost of a firm’s assets, instead Berk and DeMarzo claimed that market value of stock depends on what investors expect those assets to produce in the future. Horngren and Harrison (2008:703) support this announcement and further claim that many experts believe that book is not useful for investment analysis because it bears no relationship to market value and provides little information beyond what is reported in the balance sheet. But some investors base their

investment decisions on book value. According to Horngren and Harrison these investors are called "value" investors in contrast to "growth" investors focusing more on patterns in net income.

The issue of change in value relevance of book value over time has been examined by several researchers (e.g., Collins et al., 1997; Francis & Schipper, 1999; Gjerde et al., 2005). As discussed in section 2.3.1.1, Collins, Maydew, and Weiss (1997) suggest that a decline of value relevance of earnings induces an increase in value relevance of book values. Their findings support similar empirical studies suggesting that book values show a tendency of increased importance relative to earnings when earnings are negative or contain nonrecurring items. Collins, Maydew and Weiss suggest two reasons for explaining book values strength relative to earnings (1) book values serve as a better proxy for future earnings when current earnings contain large transitory components, and (2) book values serve as a proxy for the firm's abandonment option. To give a short summary, this research suggests that the value relevance of earnings and book values move inversely to one another implying that if value relevance of earnings has decreased over time, value relevance of book values increases.

The issue of intangible assets and value relevance of accounting information has been of interest among several researchers. Dahmash , Durand and Watson (2009) suggest that intangible assets is one of the most controversial topics that standard setters have confronted. They believe that empirical research of value relevance and intangible assets will provide useful information to investors. Corporations spend millions each year to develop new intangible assets. Whether to capitalize or expense these assets is still an ongoing debate in the accounting environment. Assuming a high level of unrecognized assets, one would expect a higher explanatory power of earnings than equity book value (Beisland, 2009). Barth, Beaver and Landsman (1998) confirm this prediction and conclude that balance sheet and income statements fulfill different roles. Aboody and Lev (1998) examined the value relevance of intangible assets in the case of software capitalization. Empirical evidence indicates that intangible assets are significantly associated with capital market variables and future earnings. They further conclude that software capitalization summarizes information relevant to investors. A recent study supporting these results is conducted by Dahmash, Durand and Watson (2009). They present evidence that identifiable



intangible assets, including goodwill, are value relevant but not reliable. They assumed that if an asset is reported with bias, the information provided is not reliable.

### **2.3.2 The value relevance of residual income value estimates**

Ohlson's work (1995) reformulated the traditional valuation model and formed the basis for the vast amount of empirical research on the residual income model. This model is primarily used when investors estimate company value. Several researchers suggest that the residual income model generates value relevant information to the investor (e.g., Frankel & Lee, 1998; Chen & Dodd, 2001).

Frankel and Lee (1998) examined the usefulness of residual income information in predicting cross sectional stock returns in the U.S. Their empirical results suggest that residual income based valuation predicts future stock returns implying residual (or abnormal) income as value relevant information. Frankel and Lee refer to empirical evidence that the firm value based on the residual income model explains more than 70% of the cross sectional variation in stock prices.

Chen and Dodd (2001) considered three profitability measures and examined which one that was generating most relevant information. The three profitability measures were introduced as the operating income, the residual income and the EVA (Economic Value Added). Stern, Stewart and Chew (1995) defined operating income as the amount of profit realized from a business's own operations and the EVA as the difference between a company's net operating income after taxes and its cost of capital of both equity and debt. Chen and Dodd do, however, find that residual income has a higher  $R^2$  and a stronger model than the EVA regressions, but it should be noted that the operating income regression exceeds with a higher  $R^2$  than the residual income regression. Their study also presents evidence that residual income measures contain significant incremental information, that is unavailable in operating income measures. In addition, their results indicate that accounting based information explains little of the variation in stock returns between firms where 90% of the variation appears to be explained by non-earnings-based information.

### **2.3.3 The value relevance of cash flows and accruals**

Bowen, Burgstahler, and Daley (1987) examined the role of cash flow data and security prices to find out whether cash flow data have incremental informational content relative to earnings.

Their findings, based on samples of 98 U.S. firms in the period 1972-81, confirms their prediction that cash flow are more value relevant than earnings. They also confirm that accrual data have incremental informational content in addition to that contained in cash flow data.

The study of Sloan (1996) investigates information contained in the accrual and cash flow components of earnings and whether this information is reflected in stock prices. Results indicate that accrual component of earnings has a lower degree of reflection in stock prices than the cash flow component of earnings. Test results also report that investors fail to distinguish between the different properties of the accrual and cash flow. Sloan further suggest that firms with high levels of accruals will experience negative future abnormal stock returns that are concentrated around future earnings announcements, and positive returns in the case of low levels of accruals. Past research show no evidence of stock prices responding in a systematic manner to the release of cash flow and accrual information (Bernard & Stober, 1989). However, Sloan emphasizes on the demonstration of his result that the information in these components are different and that stock prices do not reflect this information fully until it influences future earnings. Another study which addresses the issue of cash flow and accruals is done by Pfeiffer and Elgers (1999). They present inconsistent results to Sloan showing no statistical significance of cash flows and accruals in the regression model that relates security returns and changes in these earnings components. However, when they allow for correcting markets past mispricing and mean revision, their findings indicate a significant difference for cash flows, relative to accruals.

Misund, Osmundsen, and Asche (2005) investigated the value relevance of cash flow and accruals in the international oil and gas industry. Using samples of accounting data and market information in the period 1990-2003 generated results showing that accounting figures calculated before the expensing of depreciation are more value relevant than net figures. This indicates that cash flows and accruals are more value relevant than net income (earnings). This may not be the case for all industries considering that petroleum companies are allowed to use two different accounting methods; the successful effort method and the full cost method.

A more recent study by Beisland (2008) suggests that cash flow and accruals may reveal more relevant information which may say something more precise about the share values. He further claims that cash flow is a significant predictor of short term firm performance as measured by

future cash flow and earnings, while the accrual component is also related to future earnings but not to future cash flow.

## **2.4 Value relevance and financial health**

Several researchers have recognized that financial health and the probability of default effects value relevance of accounting information (e.g., Barth, Beaver, & Landsman, 1998; Graham, King, & Bailes, 2000; Davis-Friday & Gordon, 2005). Barth, Beaver, and Landsman (1998) predicted that as financial health decreases, the explanatory power of book value increases, while explanatory power of earnings decreases. This prediction supports the Collins, Maydew, and Weiss's statement that earnings and book values move inversely to one another. Based on data samples of 396 U.S. firms, Barth, Beaver, and Landsman (1998) report findings indicating that both earnings and book value coefficients will fall as financial health decreases. However, equity book value's coefficient and explanatory power will increase if the liquidation value effects dominate the unrecognized net assets valuation effects. They further classify firms into financial health categories, and a pooled sample of firms indicated that the equity book value are more value relevant for firms classified as being less financial healthy than other firms, while the opposite situation is found for earnings. Graham, King, and Bailes (2000) investigated value relevance of accounting information during a financial crisis. Their main objective was to examine the Thai economy collapse in 1997, and the effect on value relevance of accounting information. Their analysis suggested that the economy collapse caused a significantly decline in value relevance. Despite the decline of total value relevance in the after period, incremental value relevance of book values increased and incremental value relevance of earnings decreased. Graham, King and Bailes define incremental value relevance of book value as the explanatory power of book value over and above that of earnings.

Another study investigating the relation between market value (stock price) and accounting information (book values and earnings) during a financial distress is done by Davis-Friday and Gordon (2005). They examined whether value relevance changed in the case of the Mexican financial currency crisis in 1994. Inconsistent with Graham's et al. (2000) evidence that the relevance of earnings declines, they find remaining significance in coefficient on earnings during the crisis period. This inconsistency of results is explained by the lack of controlling negative earnings in the model specification. After controlling negative earnings, Davis-Friday and

Gordon report findings indicating an increase in valuation coefficients of positive earnings during the crisis. Their findings also show that valuation coefficient on book values are similar during and outside of the crisis period while the incremental explanatory power of book values increases relative to earnings during the crisis. However, Davis-Friday and Gordon do not support Collins, Maydew, and Weiss statement that earnings and book values move inversely. Regression results indicate that the value relevance of accounting information in Mexico does not decrease during times of economic collapse, as Collins et al. claimed. They believe the changes found in value relevance of accounting information are likely attributable to changes in market's valuation of the information rather than to the accounting system poorly measuring economic conditions during a financial crisis period. A more recent study conducted by Ibrahim et al. study (2009) examines the value relevance of accounting information during the Asian crisis in Malaysia in 1997. They show supportive evidence to Davis-Friday and Gordon that accounting earnings and book value are more valued during a financial crisis period.

## **2.5 Financial statements declining value relevance**

Several empirical studies have questioned whether the accounting information has lost its value relevance over time. The study of Francis and Schipper (1999) is one of the most quoted papers examining changes in value relevance over time. The main objective in their study concerning relevance of financial statement information to investors for valuation purposes ignoring the relevance of accounting information to other users (creditors, unions, managers and other possible uses by equity investors). They applied data samples in a long window perspective from exchange-listed and NASDAQ firms over the period 1952-94 where they distinguished between high-tech and low-technological firms. Francis and Schipper operated with two measures of value relevance; the measure of total return that could be earned from foreknowledge of financial information and the explanatory power of accounting information measuring changes in market value. Over the sample period, test results showed a decline in value relevance of earnings information and an increase in the relevance of book value information. If any decline would appear, Francis and Schipper expected a higher decline in the high-technology industries but they observed no consistent difference in the relevance of earnings between the two industries. While, book value information reports a significantly higher portion of variability in prices for low-technology firms relative to high-technology firms. Collins, Maydew, and Weiss (1997) showed the effect of adding book values as an additional independent variable along with earnings,

implying improvement and stability in value relevance over time. However, it should be noted that these studies do not address the questions of a current and future threat of a loss of relevance.

The above discussion illustrates a decline in value relevance over time but what can explain the decreasing value of accounting information? Dontoh, Radhakrishnan, and Ronen (2004) claimed that the financial statements have lost their value relevance due to a shift from a traditional capital intensive economy into a high-technology, service-oriented economy. Their study tested whether the decline in the association between stock prices and accounting information positively correlated with increased non-information-based (NIB) trading activity. Increase in NIB trading is seen as noise in stock prices and thereby reduces the observed association between stock prices and value relevant information. Dontoh, Radhakrishnan and Ronen presented evidence suggesting that the decline is driven by an increase in NIB trading. Another explanation is conducted by Collins, Maydew, and Weiss (1997) where their results suggest that the decreasing value relevance is driven by increasing frequency of nonrecurring items and negative earnings. Beisland and Hamberg (2008) suggest that researchers share a common explanation that the accounting systems fails to reflect the situation of today's enterprises implying that firm's increasingly rely on resources which cannot be recognized.

Most research that investigates changes in value relevance has been conducted in the U.S. where the majority of results suggest that accounting information has lost some of its relevance over time (e.g., Collins, Maydew, & Weiss, 1997; Ely & Waymire, 1999; Lev & Zarowin, 1999). An increasing number of international studies find no decrease in value relevance. For instance, Gjerde, Knivsflå and Sættem (2005) find a significantly increase in value relevance of financial reporting for investors trading on the Oslo Stock Exchange. Using Chinese data, Sami and Zhou (2004) reports an increase in the usefulness of accounting information in the Chinese emerging market. Similar results are also reported using data from the Czech Republic where value relevance increased over the time period 1994-2001 (Hellström, 2006). However, in a more recent study, Ibrahim et al. (2009) from Malaysia support studies with non-U.S. samples and present evidence that the accounting information reflected in earnings and book value has not declined in value relevance over time.

However, Brown, Kin and Lys (1999) argue that a scale factor common to price per share, EPS, and book value per share, BVS, induces spurious increase in value relevance over time. After

controlling for the scale, they find that incremental value relevance of both earnings and book value has declined over time. The nature of scale effect simply refers to the effect of including large firm samples. Firms with high share prices have similar effects due to non-linearity in the relation between market capitalization and the financial statement variables. Easton and Sommers (2003) also investigated the scale effect in price level and return level studies. Their statistical result show that most researchers encounter data samples driven by relatively small subset of the very largest firms in the sample. They suggest that research studies requiring a focus on price levels should run regressions using a deflator to mitigate the scale effects. Easton and Sommers suggest that return regression specification should be used whenever possible because of their capability to address the timeliness of accounting information.

As the section above discusses, there are inconsistent results concerning whether value relevance over time has declined or not. Distinctive statistical results may be explained by country characteristics. Veith and Werner (2009) show that the magnitude of value relevance varies among countries due to size of capital markets and return window applied. They suggest that in countries particularly with small capital markets, such as Norway, value relevance attains its maximum at a later point in time. This implies that capital market size has an impact on information processing of account information. In addition, Ali and Hwang's (2000) study present evidence based on an examination of 16 countries and find four country characteristics that distinguish the value relevance in the countries examined. First, they suggest that there are lower value relevance in countries with bank-oriented (as opposed to market-oriented) financial systems. Second finding presents lower value relevance for countries where private-sector bodies are not involved in the standard-setting process. Third finding indicates lower value relevance for Continental model countries relative to British-American model countries. The fourth finding suggests that value relevance is lower when tax rules significantly influence the financial accounting measurements.

## **2.6 The hypotheses**

In the development of my hypotheses, I will recap relevant arguments linked to the emphasis in this study. As mentioned in the previous sections, value relevance literature represents one of the major perspectives in capital market research and has made great contribution to accounting knowledge. The main idea of value relevance research is to determine whether the accounting

information is useful to the investor in future decision making. Several researchers have a common understanding that accounting information is denoted as value relevant if there is a statistical association between accounting information and market values of equity (e.g., Barth, 2001; Beaver, 2002; Aboody et al., 2002). Earnings and book value of equity are considered as two summary measures in financial statements, explaining the great interest among value relevance researchers to investigate such information. Studies indicated early that income statement is the most important financial report (e.g., Ball & Brown, 1968; Beaver, 1968; Kam, 1990). Throughout time, a shift is observed from a traditional capital intensive economy to a high-technology, service-oriented economy which contributes in explaining changes in value relevance over time (Dontoh et al., 2004). Several researchers suggest a decline in financial statements ability to capture and summarise information that determines the firm's value. Collins et al. (1997) indicated that the explanatory power of earnings declined over the past forty years explained by a shift in value relevance from earnings to book values. He further suggest that this is driven by the increasing frequency of negative earnings, average firm size and intangible assets implying an inversely movement in value relevance of earnings and book value. Researcher's evidence of value relevance varies largely among studies and may be explained by differences in, for instance, time intervals (e.g., Easton, Harris & Ohlson, 1992; Lee, 2001), country characteristics (Veith & Werner, 2009), or differences in financial systems (Ali & Hwang, 2000).

My emphasis in this paper is value relevance of firms listed on OSEBX and I expect that accounting information denoted in earnings and book value of equity is value relevant to investors in the Norwegian market. Expectations are based on the vast amount of studies confirming the association between market value and accounting information (e.g., Collins et al., 1997; Francis & Schipper, 1999; Barth, Beaver, & Landsman, 2001; Aboody, 2002; Gjerde et al., 2005; Ibrahim et al., 2009) and the following hypothesis is tested:

*Hypothesis 1: Accounting information reflected in earnings and book value of equity explains the variability in stock prices.*

Macroeconomic instability may increase the probability of default and accelerate to a financial collapse (Villanueva & Mirakhor, 1990). But how does this effect value relevance of earnings and book value of equity? This paper is an attempt to address this question, leading to a reassessment of determining the value relevance of accounting information in a crisis period. As

mentioned in section 2.3.1.2, Collins et al. (1997) suggest that as financial health decreases, the explanatory power of book value increases, while explanatory power of earnings decreases. Graham, King and Bailes (2000) concluded that value relevance of accounting information decreases during times of economic crisis due to a considerable decline in the explanatory power of earnings. Davis-Friday and Gordon (2005) stated that during a time of financial distress, the ability of the income statement to provide information about the firm's abnormal earnings opportunities may decline while the ability of the balance sheet to provide information about the underlying asset values may be enhanced. They further suggested that value relevance of accounting information does not decrease during times of financial distress. In addition, a recent study by Ibrahim et al. (2009) show that accounting earnings and book value and their joint explanatory power was more valued during the Asian financial crisis in 1997.

My examination period runs from 2005 to 2008 overlapping the financial crisis in 2008, which enables me to analyze both the levels and changes in the relation. The financial crisis in 2008 provides a unique opportunity to investigate whether the effects of financial distress are tempered in an environment where accounting information recognizes the effects of macroeconomic changes. My expectation is that value relevance of book value and earnings will change considerably during a financial crisis. Consistent with Collins, Maydew and Weiss, I believe that value relevance of earnings will decrease, while value relevance of book values will increase during a financial crisis. Based on the above arguments, hypothesis two is tested:

*Hypothesis 2: Value relevance of equity book value will increase and value relevance of earnings will decrease during the financial crisis in 2008.*

To test the two hypotheses, the valuation model developed by Ohlson (1995) will be applied, in which the market value of equity is considered as a function of book value and earnings. The regression models are measured employing multiple and simple regressions. The use of t-tests and F-tests determines whether there exist significant relationships in the model specifications. A more detailed review of the regression models applied is presented in section 3 (Research Design).



### **3 Research design**

This section discusses the issue of estimation of price level regressions, the selection of variables, and the role of measurements. A brief review of this paper's methodology and implementation of the overall process are presented in section 3.1. Model specifications are presented in section 3.2 and introduces the basis for empirical testing in this paper. A description of the data sample applied is presented in section 3.3 and finally a discussion of the explanatory power  $R^2$  is presented in section 3.4.

#### **3.1 Methodology approach**

The main objective of research is to determine and interpret explanations for behaviour where information is gathered and conclusions are drawn. According to Bordens and Abbott (2005:15), the scientific method consist of four cyclical steps: 1) observing a phenomenon, 2) formulating tentative explanations or statements of cause and effect, 3) further observing or experimenting to rule out alternative explanations, and 4) refining and retesting the explanations. This paper follows, to some extent, the same methodology suggested by Bordens and Abbott. First, a vast amount of previous value relevance research is reviewed in section 2 to get an in-depth understanding of the literature. The second step concerns formulating tentative explanations where the relationship between stock price and accounting information are questioned. This lays the foundation in formulating hypothesis 1 and 2 described in section 2.6. Hypothesis 2 indicates that there exist a relationship between the variables, as predicted in hypothesis 1, and function as a basis for testing the variables behaviour in macroeconomic changes. Step three concerns further observations which must be carried out to test the validity of the developed hypothesis and takes the form in a correlation study. The main objective at this stage is to measure the market value and accounting information to test if a relationship exists between the variables. Refining and retesting explanations is the final step in this scientific method study and will be more extensively interpreted in section 4 (Empirical Results).

#### **3.2 Empirical research design**

The main emphasis in an empirical study of value relevance is to examine if accounting variables can explain the variability in market variables. If there exists a relationship, measures are taken to interpret how much of the variation in the dependent stock market variable are explained by the independent accounting variables.

Research design applied in this paper consists of two stages. At the first stage, a multiple cross sectional regression is conducted to estimate the relationship between stock prices and book values and earnings (equation 1). The second stage decomposes the multiple regression model into several components where the separate explanatory power of book values and earnings are estimated (equation 2 and 3). The decomposition is applied to avoid multicollinearity problems due to the fact that year end equity contains the income of the year. Both earnings and book values are calculated in per share numbers. Prices are measured at the end of each year to avoid bias. This is considered due to the high variability in stock prices throughout a year and to reduce sample errors that may affect the accuracy of my statistical measurements.

The research design are based on price regression models where the data has the form  $\{y_i, x_i\}_{i=1}^n$ .  $Y_i$  represents the market value for firm  $i$ ,  $X_i$  variable represents firm  $i$ 's accounting information and  $n$  is the statistical observation (number of firms). Samples consist of firms listed on the Oslo Stock Exchange Benchmark Index (OSEBX) in the period 2005-2008. Each firm provide stock price information and accounting information reflected in earnings and book value information.

### 3.3 Price level regression

In order to estimate the relationship between stock prices and earnings and equity book values, a multiple price level regression is conducted:

$$P_{it} = a_0 + a_1 EPS_{it} + a_2 BVS_{it} + \varepsilon_{it} \quad (1)$$

$P_{it}$  is the stock price of firm  $i$  at year-end  $t$  ( $t=1$  for 2005),  $EPS_{it}$  is the earnings per share of firm  $i$  during year  $t$ ,  $BVS_{it}$  is the book value per share of firm  $i$  at the year-end  $t$ , and  $\varepsilon_{it}$  is the error term indicating other information for firm  $i$  for year  $t$ , independent of earnings and book values. This model is similar to Ohlson's (1995) model which assumes a strictly linear relation between measures of value and book values of accounting information, and is widely used among researchers (e.g., Collins, et.al, 1997; Francis & Schipper, 1999; Lev & Zarowin, 1999; Gjerde et al., 2005). This permits for a good comparison between my statistical results and prior research evidence.

Further, the separate explanatory power of book values and earnings are estimated:

$$P_{it} = b_0 + b_1EPS_{it} + \epsilon_{it} \quad (2)$$

$$P_{it} = c_0 + c_1BVS_{it} + \epsilon_{it} \quad (3)$$

The decomposition of the total explanatory power model is a technique theoretically derived by Theil (1971) and has been adopted by a large number of value relevance researchers (e.g., Collins, Maydew, & Weiss, 1997; Graham, King, & Bailes, 2000; Davis-Friday & Gordon, 2005). At this stage there is no control for negative earnings in the price level regressions.

As mentioned in the theoretical review, a tremendous amount of previous empirical results indicate that there exist a relationship between stock price and earnings and book values. Hence, I expect at this stage to find similar results in my statistical testing analysis of price response to earnings and book values. However, researchers show inconsistent results of the value relevance of earnings and book values during a time of financial distress, as discussed in section 2.4. Davis-Friday and Gordon (2005) claimed that the inconsistency of result was due to the lack of controlling negative earnings in the empirical analysis. Therefore, a test and control for the non-linearity caused by negative earnings are applied. A dummy variable is added in the regression models for total explanatory power and the separate explanatory power of earnings and model (1) and (2) are reformulated to:

$$P_{it} = a_0 + a_1EPS_{it} + a_2BVS_{it} + a_3EPS_{it}*D + \epsilon_{it}, \quad (4)$$

$$P_{it} = b_0 + b_1EPS_{it} + b_2EPS_{it}*D + \epsilon_{it}, \quad (5)$$

where  $D=1$  when  $EPS < 0$ , otherwise 0

Following the procedure outlined in many previous studies, the total explanatory power of book value and earnings are decomposed into the incremental component attributable to book value, the incremental component attributable to earnings, and the component common to both book value and earnings (e.g., Collins et al., 1997; Graham, King, & Bailes, 2000; Gjerde et al., 2005; Beisland & Hamberg, 2008). The notation of total adjusted explanatory power is  $R^2_{TOT}$ , and the adjusted explanatory power of stock price on EPS and BVS are respectively adjusted  $R^2_1$  and adjusted  $R^2_2$ . Within this framework, the incremental value relevance from book value per share and earnings per share will then be:

$$R^2_{BVS} = R^2_{TOT} - R^2_1$$

$$R^2_{EPS} = R^2_{TOT} - R^2_2$$

And the remaining common explanatory power is defined as:

$$R^2_{COM} = R^2_{TOT} - R^2_{EPS} - R^2_{BVS}$$

The regression estimations are calculated in both pooled and individual years. However, price level regressions tend to be negatively influenced by scale and level effects and Easton and Sommers (2003) therefore suggested adding the return regression to enhance the empirical results. Researchers have discussed over a number of years the usefulness of adding the return regression to the research problem. Researchers suggest that the return model is primarily used as a complement to the price model (Beisland & Hamberg, 2008). Chen, Chen and Su (2001) claimed that price models have two advantages over return models. Unlike return models, price models yield unbiased earnings coefficients because stock prices reflect the cumulative effect of earnings information (Kothari & Zimmerman, 1995). Secondly, Chen, Chen and Su claim that price models emphasize on the relation between firm's market value and both earnings and book values, unlike the return model only assessing value relevance of accounting earnings. I believe that the price model is better specified in my research problem and therefore the return model will not be taken into consideration in this analysis.

Like many other relevance research studies, I explore the time-series patterns in value relevance of accounting information in the Norwegian market during my sample period. To test the significance of  $R^2$  and look for time patterns the following model specification is applied:

$$\text{Adj } R^2 = d_0 + d_1t + \varepsilon_t, \text{ where } t=1-4 \quad (6)$$

Adj  $R^2$  is the adjusted explanatory power related to model (1), (2) and (3).  $t$  refers to the sample years;  $t = 1 \dots 4$  corresponds to years from 2005 to 2008. Due to the short time period examined, it should be noted that results generated from the time trend regression will only be a briefly discussion in my analysis.

### 3.4 Data sample

In order to recognize the effect of a financial crisis and how it influences the relationship between market value and accounting information, data samples are gathered in terms of overlapping the crisis period. Samples are collected from companies listed on OSEBX and vary from 67 to 80 firms representing the most tradable firms in Norway. Data information is collected from ProffForvalt and Factiva which are online database services. The samples contain end of year accounting information for all companies in the period 2005-2008 that are available in the databases. Due to unavailability to access accounting information in 2009 at this point in time, the sample period ends in 2008. The sample selection is based on data availability in ProffForvalt and Factiva and the sample size therefore varies. Differences in sample size and the size of listed companies are very small and will therefore not affect the result characteristic in the regression analysis.

**Table 1: Descriptive statistics (n=227)**

Variable	No.of observations	Mean	Standard deviation	Median
Price (P)	227	79.44	83.08	53.45
BVS	227	52.94	88.34	27.73
EPS	227	7.19	27.74	2.71

Table 1 shows the empirical distribution of the three variables price, earnings and book values per share and observes a quite large dispersion for the total sample. Median earnings per share are lower than the mean earnings per share, indicating that the distribution is skewed to the right. The same case is observed for median book values per share and median price which implies that the median is a better indicator of the centre of the distribution compared to the mean. Finally, expectations are made that earnings and book values are positively correlated with price and with each other. The results are demonstrated in table 2 below.

**Table 2: Correlation between independent and dependent variables**

Variable	Price (P)	EPS	BVS
Price (P)	1	0.32	0.62
EPS		1	0.36
BVS			1

Table 2 displays correlation matrices for the variables applied in the regression analyses and illustrates that certain variables are strongly related. In particular, observations illustrate a stronger link between price and book values than for earnings. This result makes sense as balance sheet information is more valued during a financial distress period relative to earnings, as discussed in section 2.4. The amount of negative earnings of the total data sample is 21% where 11% is reported in 2008. As expected, the correlation between stock prices and the accounting variables are significant.

### **3.5 Use of the explanatory power $R^2$**

In contrast with theoretical testing, empirical testing has to be evaluated with statistical tools. The interpretations of the empirical results in this paper follow the majority of the literature in statistical analysis where the use of adjusted  $R^2$  is extensively applied to assess and compare results with prior studies.

As several researchers assume, the  $R^2$  is referred to as the explanatory power of value relevance (e.g., Francis & Schipper, 1999; Collins et al., 1999; Lev & Zarowin, 1999; Graham, King & Bailes, 2000; Gjerde et al., 2005). Properties of  $R^2$  are presented as  $R^2 \in [0,1]$  which implies that if  $R^2 = 1$  the variability in stock price will be perfectly explained by accounting information and it will not be necessary to test the value relevance (Greene, 2008:35). While if  $R^2 = 0$ , no accounting information explains the change in stock price. Measurements of the explanatory power enable researchers to compare previous results and examine the development and changes in value relevance and are widely used among researchers. For instance, Francis and Schipper (1999) and Collins, Maydew and Weiss (1997) compared  $R^2$  results from previous studies to examine the development of value relevance the last forty years. Other researchers have implicitly applied the explanatory power to compare value relevance of different types of accounting information, such as accruals, cash flows and intangible assets (e.g., Sloan, 1996; Aboody & Lev, 1998; Pfeiffer & Elgars, 1999).

However, researchers have identified some problems using  $R^2$  as a comparison measurement. Brown, Kin and Lys (1999) suggested that the metric is unreliable in the presence of scale effects. They conclude that cross-sample  $R^2$  comparisons are not valid unless the researcher controls for differences in the coefficient of variation across the samples. Brown, Kin and Lys further suggest using a version of return regression for improvement. Even though the scale effect and the heteroscedasticity were controlled for, Gu (2007) claimed that the  $R^2$  is incomparable across samples due to inherent sampling variations. Gu (2007) recommended an alternative measure of explanatory power that is comparable across samples. He proposed that regression residual dispersion can be a better explanatory power compared to  $R^2$  if a control for nonlinear scale effects is applied in the regression analysis. The residual dispersion can be interpreted as the degree of pricing errors that are components in price not explained by accounting variables (Gu, 2007).

Therefore, another test is added to examine the value relevance of accounting information using Gu's method. Gu (2007) represent three methods of calculating the alternative explanatory power, pricing errors. These methods are expected to report consistent results and therefore only one method will be applied in my analysis and represents the estimation of standardized pricing errors. The standardized pricing errors are the residual standard deviations divided by the mean absolute fitted values of the dependent variable, formulated as  $\hat{\sigma}_e / |\bar{\hat{y}}|$ . Results from Gu's method of applying standardized pricing errors as an alternative explanatory power measure are presented in section 4.5. Findings show a tendency that pricing errors generate similar results as the adjusted  $R^2$  in measuring value relevance of accounting information. Hence, the estimates of the alternative explanatory power of pricing errors will not affect my results in measuring value relevance using  $R^2$ . A more extensively interpretation of my findings will be given in section 4.5.

## **4 Empirical results**

Section 4.1 presents empirical results examining stock price response to earnings and book values carrying out traditional price level regressions. A re-run of the regression is conducted to control for non-linearity by negative earnings is presented in section 4.2. Thereafter, value relevance over the sample period will be briefly reviewed in section 4.3. The analysis further emphasize on the consequences of the financial crisis 2008 by sorting the data sample into before and during crisis periods. Section 4.5 will provide results from the test of the alternative explanatory power

suggested by Gu (2007) and finally section 4.6 will contain a discussion of the overall empirical result in this paper.

#### **4.1 Value relevance of accounting information**

Table 3 contains result testing the first hypothesis without any considerations of negative earnings. The table shows regression coefficients, as well as the total and incremental explanatory power from the price regressions. The main focus in interpreting the results is an emphasis on the incremental value and explanatory power of adjusted  $R^2$ . Estimates of pooled and mean regression for the complete sample period is also included table 3.

Panel A of table 3 summarizes the multiple price regression on book values and earnings. Observations show a mean adjusted  $R^2$  of 42% which is relatively low compared to long window perspective studies. Gjerde, Knivsflå, and Sættem (2007) shows an adjusted mean  $R^2$  of 59.8% in a 40 year sample period in Norway, while Chen, Chen and Su (2001) report a mean adjusted  $R^2$  of 25% in a 7 year sample period in the Chinese stock market. This illustrates that shorter time-intervals may display much lower explanatory power values, as researchers have confirmed in prior studies (e.g., Easton, Harris, & Ohlson, 1992; Lee, 2001;). It should be noted that these studies does not imply that shorter-time interval studies are of less value. However, the total explanatory power of accounting information shows a significant relationship between market values and the accounting numbers in all years, applying annual F-tests. This is especially illustrated in 2008 where observations indicate that estimates are highly significant ( $F=111.83$ ). In addition, the total explanatory power appears to increase substantially in 2008, attributable to the book value's ability in becoming more value relevant in this period.

Panel A in table 3 also implies that the coefficient of book value is significant in all years except in 2005 where  $p=0.079$ , otherwise  $p=0.00$ . While earnings observations indicate that the coefficient of earnings is insignificant in all years except for 2008 ( $t=3.08$ ). These results imply that balance sheet statements capture more relevant information than income statements in this time period.

As for incremental explanatory power,  $R^2$  for the equity book values is far higher than the incremental  $R^2$  for earnings. Panel A in table 3 observes a mean incremental  $R^2$  for book values of 31% while mean incremental explanatory power for earnings is 0%. In addition, the



incremental value relevance of book value is greater than the incremental value relevance of earnings in all sample years. The high fraction of difference in book value's and earnings' incremental values are consistent with previous findings of similar studies (e.g., Gjerde, Knivsflå, & Sættem, 2005; Beisland & Hamberg, 2008). For instance, Beisland and Hamberg report a mean incremental explanatory power of book values of 23% while for earnings only 5% using Swedish data. Gjerde, et.al, (2005) show a mean incremental explanatory power of book values 28.9% and 4.6% for earnings. However, table 3 shows no clear cut trend in the incremental values but it appears to be a tendency of a decline in incremental EPS and an increase in the incremental BVS over the sample period, reflecting closely resemble reported by other researchers (e.g., Collins, et.al, 1997; Brown, Kin, & Lys, 1999; Francis & Schipper, 1999).

Panel B and C in table 3 contain estimates of the individual role of earnings and book values and support and complement the results in panel A. Coefficients on earnings per share shown in Panel B report positive values and significant results in all years except in 2008 ( $p=0.72$ ) and 2006 ( $p=0.08$ ). Coefficients on book value in Panel C are also positive and significant ( $p=0.00$ ) during the sample period. Earnings coefficients vary in the period and make it difficult to identify any trend, while book value coefficients seem to be quite stable throughout the sample period. The results from the pooled regressions in Panel B and C suggests a stronger explanatory power of book values relative to explanatory power of earnings ( $\text{Adj.R}^2_2=38\% > \text{Adj.R}^2_1=10\%$ ). The same tendency are observed in the mean estimates of explanatory power of book values ( $\text{Adj.R}^2_2=41\%$ ) and explanatory power of earnings ( $\text{Adj.R}^2_1=12\%$ ). In addition, equity book value's ability to explain stock prices is stronger compared to earnings' ability of explanation in all sample years implying higher value relevance for book values than for earnings.

It is hard to identify any clear cut trend in examining annual adjusted  $R^2$  for earnings displayed in Panel B. One might discuss whether a decline is observed in  $R^2$  for earnings but the variability is too large and the sample period too short to make concluding remarks. The mean adjusted  $R^2$  for earnings is 12% indicating a relatively low explanatory power compared to U.S. results reported by Collins et al., (1997) (mean adjusted  $R^2$  of 56.7%) and Ely and Waymire (1999) (mean adjusted  $R^2$  of 37.9%). However, in the approximately same sample period, Gjerde, Knivsflå and Sættem (2003) report 19.4% in the mean adjusted  $R^2$  of earnings. This indicates that my results are more comparable to evidence measured in the Norwegian market relative to evidence

measured in the U.S. market. Empirical findings may differ between countries due to international standardization of accounting practice (Ali & Hwang, 2000).

Observations in Panel C report relatively stable annual adjusted  $R^2$  of equity book value. The mean adjusted  $R^2$  of 41% are similar to findings in prior studies. For instance, Francis and Schipper (1999) show mean adjusted  $R^2$  for book values of 36% (high-tech firms) and 43% (low-tech firms) using U.S. samples. In addition, Graham, King and Bailes (2000) present 45% from Thailand and Gjerde, Knivsflå and Gjerde (2003) report 56% from Norway. In contrast with the individual role of earnings observations, the individual role of book value estimates are more comparable to the results of several markets.

Panel B and C show a tendency of earnings and book values moving inversely. When the value relevance of earnings decreases, then the value relevance of book value increases, assuming that value relevance is measured in adjusted  $R^2$ . This is especially illustrated in 2007 and 2008 when adjusted  $R^2$  for earnings decreases from 15% to 0%, while adjusted  $R^2$  for book values increases from 25% to 74%. These findings are consistent with Collins, Maydew and Weiss (1997). It should be noted that the difference in increase and decrease of the measurement of value relevance varies throughout time and difficulties arises to identify a distinctive trend.

In summary, I view the results of the price level regressions as providing support to previous research of value relevance of earnings and book values. As a vast amount of previous empirical studies have presented, the results in table 1 illustrates a relationship between market value and accounting information. A conclusion is drawn where accounting information reflected in earnings and book values are value relevant to investors in the Norwegian stock market. This indicates that my first hypothesis fails to be rejected.

**Table 3: Value relevance****Panel A: Multiple price level regression**

$$P_{it} = a_0 + a_1 \text{EPS}_{it} + a_2 \text{BVS}_{it} + \varepsilon_{it}$$

(p-values in parentheses)

Year	N	a1	a2	Adj.R <sup>2</sup> <sub>TOT</sub>	R <sup>2</sup> <sub>BVS</sub>	R <sup>2</sup> <sub>EPS</sub>	R <sup>2</sup> <sub>COM</sub>
2005	43	1.18 (0.21)	0.35 (0.08)	0.33	0.03	0.01	0.29
2006	54	-0.38 (0.40)	0.67* (0.00)	0.34	0.30	0.00	0.04
2007	62	-0.83 (0.25)	0.90* (0.00)	0.26	0.11	0.01	0.14
2008	68	0.39* (0.00)	0.59* (0.00)	0.77	0.77	0.03	0.00
Mean	57	0.09	0.63	0.43	0.31	0.01	0.12
Pooled	227	0.34	0.54	0.39	0.29	0.01	0.09

\*Significant at the 5% level

**Panel B: Price on earnings regression**

$$P_{it} = b_0 + b_1 \text{EPS}_{it} + \varepsilon_{it}$$

(p-values in parentheses)

Year	N	b0	b1	Adj.R <sup>2</sup> <sub>1</sub>
2005	43	61.35* (0.00)	2.51* (0.00)	0.30
2006	54	88.08* (0.00)	0.81 (0.08)	0.04
2007	62	78.98* (0.00)	1.18* (0.00)	0.15
2008	68	46.08* (0.00)	0.09 (0.72)	0.00
Mean	57	68.62	1.15	0.13
Pooled	227	72.50	0.96	0.10

\*Significant at the 5% level

### Panel C: Price on book value regression

$$P_{it} = c_0 + c_1 BVS_{it} + \varepsilon_{it}$$

(p-value in parantheses)

Year	N	c0	c1	Adj.R <sup>2</sup> <sub>2</sub>
2005	43	55.11* (0.00)	0.55* (0.00)	0.32
2006	54	65.04* (0.00)	0.61* (0.00)	0.34
2007	62	64.29* (0.00)	0.61* (0.00)	0.25
2008	68	16.70* (0.00)	0.58* (0.00)	0.74
Mean	57	50.28	0.59	0.41
Pooled	227	48.66	0.58	0.38

\*Significant at the 5% level

#### Table description

Table 1 describes the value relevance of accounting information from firms listed on the OSEBX in the time period 2005-2008. It summarizes the number of observations (N), regression intercepts ( $a_0$ ,  $b_0$  and  $c_0$ ), regression coefficients ( $a_1$ ,  $a_2$ ,  $b_1$ ,  $c_1$ ), total explanatory power ( $R^2_{TOT}$ ) as well as the separate explanatory power of book values ( $R^2_2$ ) and earnings ( $R^2_1$ ). Further, the incremental explanatory power are denoted as  $R^2_{BVS}$  for book values and  $R^2_{EPS}$  for earnings and will be considered as a metric to measure value relevance. The significance level is measured at a 5% level denoted as \* and P-values in parenthese.

## 4.2 Value Relevance controlling for negative earnings

Table 4 presents result from a re-run of the regressions to control for negative earnings, as Davis-Friday and Gordon (2005) recommended. Panel A illustrates an increase in the total mean adjusted  $R^2$ , to 47%. In addition, adjusted  $R^2$  for the total explanatory power has improved in all years and remains significant overall ( $F=7.97$  at the lowest level and  $F=80.73$  at the highest level). My results support previous evidence where researchers suggest that an adjustment for negative earnings strengthen the explanatory power of variability in market values when controlling for negative earnings (e.g., Collins et al., 1997; Francis, Shipper & Vincent, 2003; David-Friday & Gordon, 2005).

As panel A in table 4 illustrates, earnings and book value coefficients has not changed considerable controlling for negative earnings. The earnings coefficient in the first sample year

has increased slightly, otherwise decreased. The earnings coefficients are still insignificant in all years except in 2008 ( $p=0.03$ ). For book value coefficients, a slightly increase is observed and the coefficients and remains significant in all years except in 2005 ( $t=1.68$ ).

A control for negative earnings also benefit the incremental value observing a slightly increase in the mean incremental  $R^2$  of book values (from 31% to 32%) and a slightly increase in the mean incremental  $R^2$  for earnings (from 1% to 2%). Furthermore, incremental value increases in both earnings and book values in all years which enable accounting information to explain security prices better. Controlling for negative earnings also benefits the value relevance in measuring the individual role of earnings. Panel B shows a small increase to 14% in the mean explanatory power of earnings. Earnings coefficients remain insignificant in 2006 and 2008, otherwise significant ( $p=0.00$ ).

The model specification with a dummy for negative earnings appears to generate better results compared to the previous price models with higher explanatory power but the significance of coefficients remains at approximately same values. Adjusting the traditional price models to control for negative earnings improves the results and there is a reason to believe that positive and negative earnings contain transitory elements or “low quality” items. Elliot and Hanna (1996) show empirical evidence that most nonrecurring items are losses. Collins et al. (1997) suggest that nonrecurring items provide a partial explanation for the observed decline in value relevance of earnings throughout time. They further suggest that these items are more likely to be transitory relative to earnings before nonrecurring items. He further suggests that the value relevance of book values increases in the existence of nonrecurring items.

**Table 4: Value relevance, dummy for negative earnings****Panel A: Multiple price level observation**

$$P_{it} = a_0 + a_1 \text{EPS}_{it} + a_2 \text{BVS}_{it} + a_3 \text{EPS}_{it} * D + \varepsilon_{it}$$
, where  $D=1$  when  $\text{EPS} < 0$ , otherwise 0

(p-values in parentheses)

Year	N	a1	a2	a3	Adj. $R^2_{TOT}$	$R^2_{BVS}$	$R^2_{EPS}$	$R^2_{COM}$
2005	43	1.42 (0.15)	0.32 (0.11)	40.97 (0.34)	0.33	0.03	0.02	0.28
2006	54	-0.57 (0.19)	0.67* (0.00)	-49.59* (0.04)	0.41	0.31	0.01	0.09
2007	62	-1.08 (0.12)	0.95* (0.00)	-64.06* (0.01)	0.34	0.13	0.02	0.19
2008	68	0.30* (0.03)	0.61* (0.00)	-15.28 (0.09)	0.78	0.78	0.01	0.00
Mean	57	0.02	0.64	-21.99	0.47	0.32	0.02	0.14
Pooled	227	0.12	0.57	-38.15	0.43	0.32	0.00	0.11

\*Significant at the 5% level

**Panel B: Price on earnings regression, dummy for negative earnings**

$$P_{it} = b_0 + b_1 \text{EPS}_{it} + b_2 \text{EPS}_{it} * D + \varepsilon_{it}$$

(p-values in parentheses)

Year	N	b0	b1	b2	Adj. $R^2_1$
2005	43	54.62 (0.00)	2.67* (0.00)	51.75 (0.23)	0.30
2006	54	98.67 (0.00)	0.58 (0.23)	-57.18 (0.06)	0.10
2007	62	89.51 (0.00)	1.04* (0.00)	-60.58* (0.03)	0.21
2008	68	45.39 (0.00)	0.10 (0.74)	0.87 (0.96)	0.00
Mean	57	72.03	1.10	-16.29	0.15
Pooled	227	77.65	0.85	-22.85	0.11

\*Significant at the 5% level

**Table description**

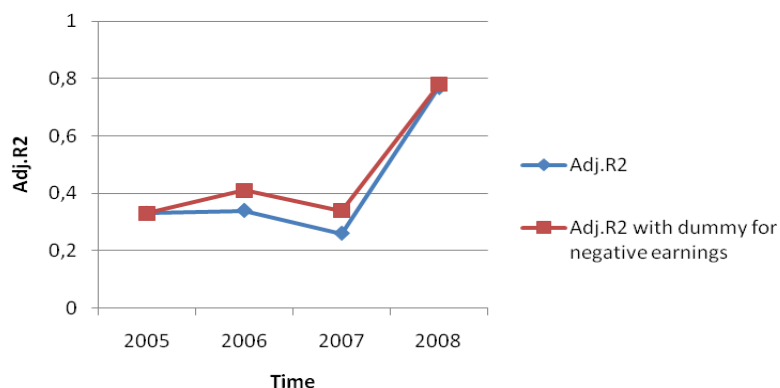
Table 4 describes the value relevance of accounting information with a dummy controlling for negative earnings. It summarizes the number of observations (N), regression coefficients (a1, a2, a3, b0, b1), total explanatory power (adj.  $R^2_{TOT}$ ), explanatory power of earnings (adj.  $R^2_1$ ), and incremental values for book value ( $R^2_{BVS}$ ), earnings ( $R^2_{EPS}$ ), and the common incremental explanatory power ( $R^2_{COM}$ ).

### **4.3 Value relevance over the time period 2005-2008**

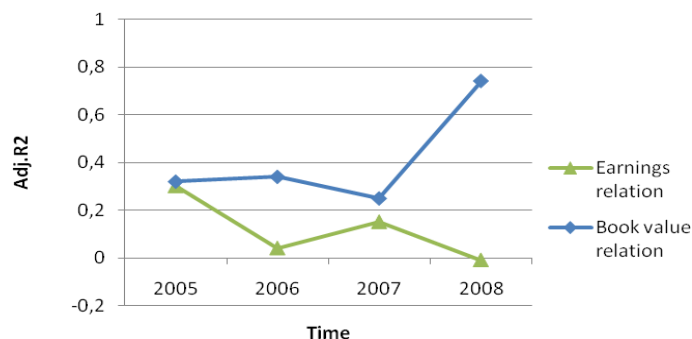
As table 3 and 4 present, the corresponding values of the regression results related to the sample period 2005-2008 show volatile  $R^2$  values with no distinct pattern of value relevance over time, and this is further confirmed in figure 1. Figure 1 illustrates the development of value relevance applying traditional price level regression and a control for negative earnings implying no extremely differences using model (1) and (4). The substantial increase in value relevance in 2008 is explained by the high increase in the explanatory power of book value, as figure 2 illustrate. Figure 2 also demonstrate the inversely movement between earnings and book value discussed in section 4.1. This encourages me to measure the value relevance over time to test whether an underlying increase or decrease in value relevance is observed. Therefore, an examination of the time trend pattern is conducted.

As a vast amount of previous studies, I run a time trend regression to look for patterns. Table 5 provides test results of the significance of value relevance time patterns relating to model (1), (2) and (3). No time trend coefficient estimate is significantly different from zero ( $p > 0.005$  for all coefficients) in the total price model, neither in the separately earnings relation nor the book value relation. In addition, the adjusted  $R^2$  for the three model specifications also show insignificance using F-tests. Although earnings and book value data are value relevant suggested by the adjusted  $R^2$  in table 3 and 4, time trend analysis indicate that no significant increase (or decrease) in value relevance has taken place over the period 2005-2008 in Norway. It is important to note that the examination period only runs in four observation years and whether time trend analysis is appropriate and necessary in this very short window perspective may be discussed.

**Figure 1: Value relevance measured by total adjusted  $R^2$**



**Figure 2: Value relevance of earnings relation and book value relation**



**Table 5: Time trend regression 2005-2008**

(p-values in parentheses)

Dependent variable	$d_0$	$d_1$	Adj. $R^2$
Adj. $R^2$	0.20 (0.54)	0.07 (0.22)	0.41
Earnings relation	0.32 (0.13)	-0.08 (0.23)	0.39
Book value relation	0.24 (0.67)	0.09 (0.32)	0.19

\*Significant at the 5% level

**Table description**

Table 5 present the time trend regression applying model (4)  $\text{Adj } R^2 = d_0 + d_1 t + \varepsilon_t$  where  $t=1-4$  and represent the sample period 2005-2008. The time trend regression estimate the dependent variable, adjusted  $R^2$ , from model (1)  $P_{it} = a_0 + a_1 \text{EPS}_{it} + a_2 \text{BVS}_{it} + \varepsilon_{it}$ , (2)  $P_{it} = b_0 + b_1 \text{EPS}_{it} + \varepsilon_{it}$  and (3)  $P_{it} = c_0 + c_1 \text{BVS}_{it} + \varepsilon_{it}$ . The table summarizes time regression coefficients ( $d_0$ ,  $d_1$ ) and the time trend explanatory power (adj. $R^2$ ).



#### **4.4 Value relevance before and during the financial crisis**

I test for difference in value relevance during the world financial crisis in 2008 by dividing the data samples into before (2005-2007) and during (2008) periods. Table 6 presents result from testing the second hypothesis relating to the consequences of the financial crisis in 2008. The model specification with a dummy for negative earnings appears to be a better model as discussed in section 4.2, hence, I apply this for evaluating value relevance in the crisis period.

Table 6 shows statistical significance in total value relevance both before and during the crisis, using the F-statistics. Total adjusted  $R^2$  before the crisis indicates that earnings and book value are able to explain 32% of the variation in stock price. A substantial increase is observed in the total adjusted  $R^2$  during the crisis showing an ability to explain 78% of the variation in the stock price at a significant level of  $F=78.54$ . This is due to an increase from 31% to 74% in the explanatory power of book values during the crisis period. While the explanatory power of earnings,  $\text{adj.}R^2_1$ , decreases to 0%. The increase in the total explanatory power is consistent with previous studies investigating value relevance during economic conditions characterized by financial distress (e.g., Davis-Friday & Gordon, 2005; Ibrahim et al., 2009). Though, my results report a considerable high increase in total value relevance compared to similar studies presenting much lower increase values. However, my findings suggest that as financial health decreases, the explanatory power of book values increases, while decrease for earnings, as Barth, Beaver and Landsman (1998) predicted. My result also supports Collins, Maydew and Weiss (1997) statement that earnings and book values move inversely to one another. These results are inconsistent to Graham, King and Bailes (2000) findings suggesting a decline in total value relevance during the Thai economy collapse in 1997. Even though Graham, King and Bailes report similar findings that the explanatory power of book values increases, the decrease in the explanatory power of earnings is highly dominating and causes a decline in the total value relevance reflecting the consequences of the Thai crisis. My findings support Davis-Friday and Gordon (2005) evidence that an increase in the total value relevance of accounting information appears during a financial crisis period, attributable to an increase in the value relevance of book values. In addition my result also support Beisland and Hamberg (2008) findings indicating that as financial health increases, accounting information appears less capable to explain market

value, while when economy slows down and stock prices decrease, there is a better association between accounting numbers and share prices.

The incremental values also display some interesting results. Incremental explanatory power of book values increases substantially in the crisis period (18% before, 78% in crisis). The incremental explanatory power for earnings also increases, but only a slightly improvement is observed (1% before, 4% in crisis). These results indicate that investors turn to balance sheet information rather than income statements during financial crisis. This is inconsistent with Graham's et al. results. Graham, King and Bailes (2000) report evidence of an increase in the incremental explanatory power of book value but a decrease in the incremental explanatory power of earnings. Davis-Friday and Gordon (2005) support Graham et al. results of a decrease in the incremental explanatory power of earnings, before controlling for negative earnings.

However, after controlling for negative earnings, Davis-Friday and Gordon shows an improvement in the incremental explanatory power of earnings. This illustrates the lack of adjusting for negative earnings in Graham's results. The incremental value estimates in table 4 suggest an increase both in the value relevance of book value and earnings information in a crisis period. One may discuss whether the incremental value of earnings is a reliable measurement of an increasing value relevance of earnings, since the improvement is caused by considerable high increase in explanatory power of book values.

Table 6 also reports significant book value coefficients both before and during the crisis ( $p=0.00$ ) period. Earnings coefficients are not significant before the financial crisis period but show a significant earnings coefficient during the crisis ( $p=0.035$ ). Consistent with Davis-Friday and Gordon's results, I find that the separately explanatory power of book values increases during the crisis while the explanatory power of earnings decreases. Before and during the crisis, book values retain their explanatory power relative to earnings. The decline in value relevance of earnings could be expected as negative earnings cannot persist indefinitely, shareholders become more likely to value a firm based on its liquidation value rather than its earnings potential (Graham, King, & Bailes, 2000). Graham et al. (2000) claims that as liquidation value becomes more relevant for assessing firm value, so will the incremental explanatory power of book value. Barth, Beaver and Landsman (1998) stated earlier that liquidation values and probability of default effect equity values. They confirm that as financial health decreases, equity book value's

incremental value increases while incremental value of earnings decreases. They further claim that a decreased financial health, unrecognized net assets diminish in value explaining the decline in incremental explanatory power of earnings. This implies that if liquidation effect dominates, the equity book value's explanatory power will increase.

In the overall findings in testing hypothesis two, I find supportive evidence relative to prior research. My results suggest that accounting information reflected in earnings and book value are more value relevant during the financial crisis period as compared to the before period. Relative to earnings, the explanatory power and the incremental values suggest that equity book values are more valued by investors both before and during the financial crisis. The explanatory power of book value and earnings seem to move inversely implying an increase in book value's explanatory power and a decrease in explanatory power of earnings during the financial crisis period. This indicates that hypothesis two fails to be rejected.

In short summary of my empirical results, I view my results as providing support to previous studies indicating that there is a statistical relationship between market value and accounting information. Accounting information reflected in earnings and book values are value relevant to investors in the Norwegian stock exchange market, and my first hypothesis fails to be rejected. A control for negative earnings improves the results and enhances the measurements of value relevance. The time period 2005-2008 shows no distinct pattern and it is difficult to identify any trend. Time trend regression indicates no significant increase (or decrease) in value relevance in the data sample period. The total explanatory power of value relevance shows a significant improvement during the financial crisis in 2008, attributable to a substantial increase in value relevance of book value. Results also report a significant increase in the explanatory power of book value, while a decrease in the value relevance of earnings. This indicates that my second hypothesis also fails to be rejected.

**Table 6: Value relevance before and during the crisis**

$$P_{it} = a_0 + a_1EPS_{it} + a_2BVS_{it} + a_3EPS_{it} * D + \varepsilon_{it}$$

(p-values in parentheses)

Regression Results	N	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	Adj.R <sup>2</sup> <sub>TOT</sub>	R <sup>2</sup> <sub>BVS</sub>	R <sup>2</sup> <sub>EPS</sub>	R <sup>2</sup> <sub>COM</sub>
Before crisis	159	-0.26 (0.43)	0.61* (0.00)	-38.91 (0.02)	0.32	0.18	0.01	0.13
During crisis	68	0.29* (0.04)	0.61 (0.00)	-16.55 (0.07)	0.78	0.78	0.04	0.00

\*Significant at the 5% level

#### Table description

Table 4 test for differences in the relation between market values and book values and earnings before and during the economy collapse in 2008. The regression results are estimated using price model (4) and show coefficients (a<sub>1</sub>, a<sub>2</sub>, a<sub>3</sub>) as well as explanatory power (adj. R<sup>2</sup><sub>TOT</sub>, adj. R<sup>2</sup><sub>1</sub>, adj. R<sup>2</sup><sub>2</sub>) and incremental values (R<sup>2</sup><sub>BVS</sub>, R<sup>2</sup><sub>EPS</sub>, R<sup>2</sup><sub>COM</sub>). The before period contain samples from 2005-2007 and during the crisis contain samples from 2008.

## 4.5 Pricing error versus R<sup>2</sup>

Table 7 show test results applying Gu's (2007) alternative measurement of the explanatory power, pricing error. Gu (2007) claims that the regression of R<sup>2</sup> is not a comparable measurement across research studies and suggest pricing errors as the best measurement. Gu further define pricing errors measure as the fraction of what is not explained by accounting variables.

Table 7 reports a tendency of an inversely movement between pricing errors and R<sup>2</sup>. When the explanatory power of R<sup>2</sup> increases, pricing errors decreases, and when R<sup>2</sup> decreases, pricing errors increases. The residual standard deviation determines the level of pricing errors and consequently shows similar patterns between explanatory powers of R<sup>2</sup>. For instance, table 7 shows a decrease in 2006-2007 in R<sup>2</sup> from 34% to 26% while residual standard deviations show an increase from 64.40 to 69.46. This indicates that when R<sup>2</sup> are at low levels of explanatory power, high fraction of  $\hat{\sigma}_\varepsilon$  is observed, and when R<sup>2</sup> is high, low values of  $\hat{\sigma}_\varepsilon$  is reported. This is especially illustrated by the change in 2007-2008 presenting a substantial increase from 26% to 77% in R<sup>2</sup> and a considerable decrease in the residual standard deviation from 69.46 to 32.38.

This is a reasonable result as an increase in pricing errors expresses decreased value relevance and a decrease in pricing errors expresses increased value relevance (Gu, 2007).

Due to the effect of price fluctuations, the residual standard deviation illustrates the tendency of inversely relation between  $R^2$  and pricing error in a better way. This indicates that the residual standard deviation shows a stronger demonstration of the close similarities of applying the explanatory power  $R^2$  and pricing errors in measuring value relevance of accounting information. For instance, since  $R^2$  reached its highest level in 2008, expectations that pricing errors will reach its lowest level at the same time are reasonable to believe. Pricing error reached its lowest level in 2006 and is explained by the high average stock prices. The effect of price fluctuations on pricing errors is illustrated especially in 2008 when the average stock price dropped dramatically and the residual standard deviation falls considerable as mentioned above.

In short summary, the residual standard deviation suggests an increase in value relevance when  $R^2$  increases and a decrease in value relevance when  $R^2$  decreases. Further, observations in residual standard deviations suggest an increase in the value relevance of accounting information during a financial crisis. These results indicate similar results applying  $R^2$  as explanatory power measurement. Gu's (2007) method will therefore not affect my previous measurements of value relevance.

Even though researchers argue that the explanatory power of  $R^2$  is not the best goodness-of-fit (e.g., Draper, 1984; Healy, 1984; Cramer, 1987), the minority of value relevance studies throughout time actually apply alternative explanatory powers in measuring value relevance others than  $R^2$ . The lack of studies using alternative explanatory power may be explained by the comparability issue to prior research. Researchers emphasize largely on previous results in order to survey their own findings. Applying other alternative explanatory power measures other than  $R^2$  may weaken the ability to compare results across other studies due to the lack of previous studies applying alternative explanatory powers. However, the minority of studies using alternative measures may also be explained by the tendency of generating similar evidence in comparing to the explanatory power of  $R^2$ , as my results in table 7 suggests. My findings are also showing support to Beisland's (2008) study where a test of Gu's (2007) alternative explanatory power method generate exactly same results as  $R^2$ .

**Table 7: Pricing error versus  $R^2$** 

Year	$\hat{\sigma}_\varepsilon$	$ \bar{P} $	$\hat{\sigma}_\varepsilon /  \bar{P} $	Adj. $R^2_{TOT}$
2005	75.98	92.37	0.82	0.33
2006	64.40	97.84	0.66	0.34
2007	69.46	91.33	0.76	0.26
2008	32.38	45.80	0.71	0.77

**Table description**

The standardized pricing errors are the residual standard deviations divided by the mean absolute fitted values of the stock price from the multiple price level regression, model (1).  $\hat{\sigma}_\varepsilon$  is the residual standard deviation for all firm samples in year t,  $|\bar{P}|_t$  is the mean absolute fitted value of stock price in year t, and  $\hat{\sigma}_\varepsilon / |\bar{P}|_t$  is the standardized pricing error. Adjusted  $R^2_{TOT}$  (hereafter  $R^2$ ) is explanatory power from regression model (1), the multiple price level.

**4.6 Discussion**

Macroeconomic instability may accelerate to a financial collapse. An example of this is the financial crisis in 2008 when financial institutions globally were damaged. Value relevance is a major area in capital market research where the minority of studies enhances value relevance and financial distress. There are some researchers that have empirically examined the value relevance during economic crisis periods. It is therefore very interesting to examine the impact on value relevance in the Norwegian market during a financial crisis period. This section will briefly discuss my expectations and limitations in this paper and give a brief summary of my results relative to previous studies. This discussion will also be complementary to the concluding remarks.

My expectations relates to the vast amount of studies investigating value relevance of accounting information that recognizes the existence of an association between market value and accounting information. As expected, my empirical results in testing hypothesis 1 suggests that accounting information denoted in earnings and equity book value are value relevant to investors in the Norwegian stock market. Though, the explanatory power of value relevance reported in the analysis is lower compared to similar studies. This may be due to differences in the window perspectives (e.g., Easton, Harris, & Ohlson, 1992; Lee, 2001), country characteristics (Veith &

Werner, 2009), or model specification applied (Beaver, McAnnally, & Stinson, 1997), as discussed in section 2. However, findings confirm that accounting information reflected in earnings and book values has a significant impact on stock prices. Previous studies suggest that book value is becoming more relevant compared to other accounting variables (e.g., Collins et al., 1997; Brown, Kin, & Lys, 1999; Francis & Schipper, 1999; Gjerde et al., 2007). As expected, multiple and simple price regressions show a stronger explanatory power of equity book value relative to the earnings explanatory power. In addition, table 3 and 4 observe a tendency of an inversely movement in the explanatory power between earnings and book value, a relationship suggested by Collins, Maydew and Weiss (1997).

Several researchers suggest that controlling for negative earnings benefit accounting information's ability to explain security prices (e.g., Francis & Vincent, 2003; Davis-Friday & Gordon, 2005). As expected, an improvement in value relevance appears when adjusting for negative earnings in my model specification. Controlling for negative earnings benefit value relevance of accounting information but it does not affect my original results using traditional price regression.

Result in table 7 shows a significant increase in the total value relevance during the financial crisis in 2008. This is attributable to a considerable high increase in the explanatory power of equity book value. The considerable improvement is surprising compared to similar research that presents a lower fraction of increase in the total value relevance. However, measuring explanatory power  $R^2$ , the equity book value initially increases during the financial crisis, while earnings explanatory power decreases. This relationship is consistent across value relevance studies. Graham, King and Bailes (2000) claimed that as value relevance of earnings decline, shareholders become more likely to value a firm based on liquidation value rather than earnings potential. They further suggested that as liquidation value becomes more relevant for assessing firm value, consequently the value relevance of book value also increases. Barth, Beaver and Landsman (1998) stated earlier that liquidation values and probability of default effects equity values. They confirm that as financial health decreases, equity book value's incremental value increases while incremental value of earnings decreases. Implying that if liquidation effect dominates the equity book value's explanatory power will increase. Based on the above arguments, my results fulfill my expectations. In addition, the individual role of book value

shows a stronger ability to explain market value relative to earnings both before and during the financial crisis.

Results in table 6 support Davis-Friday and Gordon (2005) evidence of an increasing incremental value in both book values and earnings during a crisis period. One may discuss whether the incremental increase of earnings is a reliable suggestion since the increase is caused by considerable changes in the value relevance of book values. Emphasis is therefore put on the explanatory power of adjusted  $R^2$  as a measure of value relevance.

Since the crisis also unfolds in 2009, one may discuss whether accounting information from 2009 will give more accurate measurements of value relevance during the financial crisis. Because of unavailable access to accounting information at this point in time, the data sample period ends in 2008. Consequently, my data results have limited insight in the “after” crisis period which may have affected the comparability to prior studies containing such information. The issue of time lags may also affect measurements of value relevance during the crisis period. Yet, there will always be a time lag between accounting information and the real values of the company (Debels & Vandecasteele, 2008). Companies reporting good financial figures from 2008 show falling share prices. Normally, it is reasonable to expect that good financial figures provide rising share prices. Further, my results are subjected to a relatively small data sample which may also affect the empirical result. Based on the above arguments, I suggest using larger data and samples containing information from the “after” crisis to achieve more precise and accurate measurements in future research.

## **5 Concluding remarks**

Given the vast amount of value relevance it is impossible to adequately summarize the entire literature; hence, this study reviews some of the main research areas. Questions arise why value relevance literature is characterized by inconsistent empirical results. This has created many discussions where each presents a unique explanation. I cite a variety of reasons illustrating why distinctive empirical evidence appears in the value relevance literature. The main reason is the variety of different perspectives and methods applied by researchers. I believe that empirical evidence is distinctive due to differences in country characteristics, window time perspectives, and model specification.



This study provides an empirical examination of whether investors in the Norwegian stock market perceive accounting information, denoted in earnings and book value, to be value relevant. Using samples of available observations listed on the Oslo Stock Exchange Benchmark Index (OSEBX) from 2005 to 2008, empirical results support a large number of prior studies suggesting that accounting information is value relevant. My findings further suggest that book value of equity has a stronger ability to explain the variation in stock prices relative to earnings, regardless of which model specification applied. In addition, an inversely movement is observed in the explanatory power of between earnings and book value, implying that when value relevance of earnings decreases, the value relevance of equity book value increases. This relationship is consistent across studies.

There is a lack of studies investigating the value relevance of accounting information in the Norwegian stock market, especially during financial distress periods. Hence the main emphasis in this study is to examine the value relevance of accounting information during the financial crisis in 2008. Past research has suggested that there is a better association between accounting information and stock prices when the economy slows down (e.g., Beisland & Hamberg, 2008; Davis-Friday & Gordon, 2005; Ibrahim et al., 2009). My empirical results show that the total value relevance of accounting earnings and book values has increased significantly during the financial crisis, attributable to an increase in the value relevance of book values. As predicted, I find a significantly increase in the explanatory power of book value and a decrease in the explanatory power of earnings during the crisis period. The change in value relevance may be directly attributable to the dominance of a liquidation effect. This effect suggests that as financial health decreases, equity book value's incremental explanatory power increases while incremental explanatory power for earnings decreases (Barth, Beaver, & Landsman, 1998). As value relevance of earnings decline, shareholders become more likely to value a firm based on liquidation value rather than earnings potential. If the liquidation effect contributed to disruption in the value relevance of accounting information during the crisis, the disruption is likely to be temporary. My findings indicate that investors value balance sheet information considerable higher relative to income statements during the financial crisis in 2008. Based on these results, I believe that the changes in value relevance during the economy collapse are likely to be attributable to changes in stock price information rather than the accounting systems poorly measuring the financial conditions.

Researchers have identified some problems using  $R^2$  as a comparison measurement. Hence, this study also tests whether the alternative explanatory power of pricing error suggested by Gu (2007) is a better goodness-of-fit. My findings indicate that the explanatory power  $R^2$  and pricing error show similar results which may explain the lack of studies using alternative explanatory powers others than  $R^2$  in measuring value relevance. The minority of value relevance studies applying an alternative explanatory power others than  $R^2$  may also be explained by the comparability issue to other statistical research. Hence, this creates difficulties in surveying own findings.

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## Appendices

### APPENDIX A: ANOVA FROM TABLE 3

#### YEAR 2005

##### PRICE ON EARNINGS AND BOOK VALUE

Source	SS	df	MS	Number of obs = 43		
Model	139615.061	2	69807.5307	F( 2, 40)	=	11.52
Residual	242487.622	40	6062.19055	Prob > F	=	0.0001
				R-squared	=	0.3654
				Adj R-squared	=	0.3337
Total	382102.683	42	9097.68294	Root MSE	=	77.86

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	1.181252	.9272516	1.27	0.210	-.6927934	3.055297
BVS	.3541185	.1960569	1.81	0.078	-.0421273	.7503643
_cons	53.88036	14.37883	3.75	0.001	24.81967	82.94106

##### PRICE ON EARNINGS

Source	SS	df	MS	Number of obs = 43		
Model	119837.966	1	119837.966	F( 1, 41)	=	18.73
Residual	262264.717	41	6396.70042	Prob > F	=	0.0001
				R-squared	=	0.3136
				Adj R-squared	=	0.2969
Total	382102.683	42	9097.68294	Root MSE	=	79.979

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	2.509908	.5798807	4.33	0.000	1.338815	3.681001
_cons	61.35339	14.14554	4.34	0.000	32.7859	89.92088

##### PRICE ON BOOK VALUE

Source	SS	df	MS	Number of obs = 43		
Model	129776.774	1	129776.774	F( 1, 41)	=	21.09
Residual	252325.91	41	6154.29048	Prob > F	=	0.0000
				R-squared	=	0.3396
				Adj R-squared	=	0.3235
Total	382102.683	42	9097.68294	Root MSE	=	78.449

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
BVS	.5522601	.1202636	4.59	0.000	.3093828	.7951373
_cons	55.1086	14.45504	3.81	0.000	25.91607	84.30114

# **YEAR 2006**

## PRICE ON EARNINGS AND BOOK VALUE

Source	SS	df	MS	Number of obs =	54
Model	124435.946	2	62217.9728	F( 2, 51) =	14.43
Residual	219829.245	51	4310.37735	Prob > F =	0.0000
				R-squared =	0.3615
				Adj R-squared =	0.3364
Total	344265.191	53	6495.56963	Root MSE =	65.653

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
EPS	-.3816143	.4498084	-0.85	0.400	-1.284642 .5214137
BVS	.671497	.1364048	4.92	0.000	.397653 .945341
_cons	66.24638	10.95664	6.05	0.000	44.25001 88.24276

## PRICE ON EARNINGS

Source	SS	df	MS	Number of obs =	54
Model	19977.3195	1	19977.3195	F( 1, 52) =	3.20
Residual	324287.871	52	6236.30521	Prob > F =	0.0793
				R-squared =	0.0580
				Adj R-squared =	0.0399
Total	344265.191	53	6495.56963	Root MSE =	78.97

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
EPS	.8148374	.4552669	1.79	0.079	-.0987223 1.728397
_cons	88.0849	12.05048	7.31	0.000	63.90384 112.266

## PRICE ON BOOK VALUE

Source	SS	df	MS	Number of obs =	54
Model	121333.462	1	121333.462	F( 1, 52) =	28.30
Residual	222931.728	52	4287.14862	Prob > F =	0.0000
				R-squared =	0.3524
				Adj R-squared =	0.3400
Total	344265.191	53	6495.56963	Root MSE =	65.476

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
BVS	.6089683	.1144692	5.32	0.000	.379269 .8386675
_cons	65.04403	10.83528	6.00	0.000	43.30144 86.78661

**YEAR 2007**PRICE ON EARNINGS AND BOOK VALUE

Source	SS	df	MS	Number of obs = 62		
Model	116240.951	2	58120.4755	F( 2, 59)	=	11.65
Residual	294376.89	59	4989.43881	Prob > F	=	0.0001
				R-squared	=	0.2831
				Adj R-squared	=	0.2588
Total	410617.841	61	6731.44001	Root MSE	=	70.636

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	-.8325998	.7120349	-1.17	0.247	-2.257378	.5921788
BVS	.9016849	.2841787	3.17	0.002	.3330446	1.470325
_cons	59.80685	11.33601	5.28	0.000	37.12353	82.49016

PRICE ON EARNINGS

Source	SS	df	MS	Number of obs = 62		
Model	66009.2196	1	66009.2196	F( 1, 60)	=	11.49
Residual	344608.621	60	5743.47702	Prob > F	=	0.0012
				R-squared	=	0.1608
				Adj R-squared	=	0.1468
Total	410617.841	61	6731.44001	Root MSE	=	75.786

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	1.178981	.3477698	3.39	0.001	.4833376	1.874624
_cons	78.97748	10.29099	7.67	0.000	58.39243	99.56252

PRICE ON BOOK VALUE

Source	SS	df	MS	Number of obs = 62		
Model	109418.795	1	109418.795	F( 1, 60)	=	21.80
Residual	301199.046	60	5019.9841	Prob > F	=	0.0000
				R-squared	=	0.2665
				Adj R-squared	=	0.2542
Total	410617.841	61	6731.44001	Root MSE	=	70.852

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
BVS	.6058159	.1297615	4.67	0.000	.3462542	.8653775
_cons	64.29011	10.70056	6.01	0.000	42.88581	85.69441

**YEAR 2008**PRICE ON EARNINGS AND BOOK VALUES

Source	SS	df	MS	Number of obs = 68		
Model	241645.567	2	120822.784	F( 2, 65)	=	111.83
Residual	70224.367	65	1080.37488	Prob > F	=	0.0000
				R-squared	=	0.7748
				Adj R-squared	=	0.7679
Total	311869.934	67	4654.77514	Root MSE	=	32.869

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.3946509	.1282413	3.08	0.003	.1385353	.6507665
BVS	.5944744	.0397994	14.94	0.000	.5149896	.6739593
_cons	16.85964	4.454934	3.78	0.000	7.962527	25.75676

PRICE ON EARNINGS

Source	SS	df	MS	Number of obs = 68		
Model	605.963286	1	605.963286	F( 1, 66)	=	0.13
Residual	311263.971	66	4716.12077	Prob > F	=	0.7211
				R-squared	=	0.0019
				Adj R-squared	=	-0.0132
				Root MSE	=	68.674
Total	311869.934	67	4654.77514			

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.094859	.2646354	0.36	0.721	-.4335027	.6232207
_cons	46.07703	8.362566	5.51	0.000	29.38063	62.77343

PRICE ON BOOK VALUE

Source	SS	df	MS	Number of obs = 68		
Model	231413.937	1	231413.937	F( 1, 66)	=	189.83
Residual	80455.9974	66	1219.03026	Prob > F	=	0.0000
				R-squared	=	0.7420
				Adj R-squared	=	0.7381
				Root MSE	=	34.915
Total	311869.934	67	4654.77514			

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
BVS	.5753056	.0417552	13.78	0.000	.4919385	.6586726
_cons	16.69595	4.731843	3.53	0.001	7.248521	26.14338

**YEAR, 2005-2008: POOLED DATA**

PRICE ON EARNINGS AND BOOK VALUE

Source	SS	df	MS	Number of obs = 227		
Model	613404.682	2	306702.341	F( 2, 224)	=	72.58
Residual	946614.053	224	4225.95559	Prob > F	=	0.0000
				R-squared	=	0.3932
				Adj R-squared	=	0.3878
				Root MSE	=	65.007
Total	1560018.73	226	6902.73776			

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.339055	.1672227	2.03	0.044	.0095241	.668586
BVS	.5428035	.0525047	10.34	0.000	.4393373	.6462698
_cons	48.26451	5.036829	9.58	0.000	38.33888	58.19014

PRICE ON EARNINGS

Source	SS	df	MS	Number of obs = 227		
Model	161741.743	1	161741.743	F( 1, 225)	=	26.03
Residual	1398276.99	225	6214.56441	Prob > F	=	0.0000
				R-squared	=	0.1037
				Adj R-squared	=	0.0997
				Root MSE	=	78.833
Total	1560018.73	226	6902.73776			

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.9644634	.1890515	5.10	0.000	.5919255	1.337001
_cons	72.50268	5.405961	13.41	0.000	61.84989	83.15547

PRICE ON BOOK VALUE

Source	SS	df	MS	Number of obs = 227		
Model	596031.691	1	596031.691	F( 1, 225)	=	139.12
Residual	963987.044	225	4284.38686	Prob > F	=	0.0000
				R-squared	=	0.3821
				Adj R-squared	=	0.3793
				Root MSE	=	65.455
Total	1560018.73	226	6902.73776			

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
BVS	.5813156	.0492858	11.79	0.000	.4841948	.6784363
_cons	48.66348	5.06766	9.60	0.000	38.67734	58.64963

## APPENDIX B: ANOVA FROM TABLE 4

### YEAR 2005

#### PRICE ON EARNINGS, BOOK VALUE AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs =	43
Model	145278.287	3	48426.0958	F( 3, 39) =	7.97
Residual	236824.396	39	6072.42041	Prob > F =	0.0003
				R-squared =	0.3802
				Adj R-squared =	0.3325
				Root MSE =	77.926
Total	382102.683	42	9097.68294		

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
EPS	1.416082	.9593624	1.48	0.148	-.5244112 3.356576
BVS	.3242718	.1986413	1.63	0.111	-.0775182 .7260617
dummy	40.97405	42.42852	0.97	0.340	-44.84573 126.7938
_cons	49.18083	15.19148	3.24	0.002	18.45317 79.90849

#### PRICE ON EARNINGS AND DUMMY FOR NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs =	43
Model	129095.957	2	64547.9785	F( 2, 40) =	10.20
Residual	253006.726	40	6325.16816	Prob > F =	0.0003
				R-squared =	0.3379
				Adj R-squared =	0.3047
				Root MSE =	79.531
Total	382102.683	42	9097.68294		

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
EPS	2.665062	.5907183	4.51	0.000	1.471176 3.858949
dummy	51.75044	42.77517	1.21	0.233	-34.7014 138.2023
_cons	54.62234	15.12656	3.61	0.001	24.05041 85.19426

### YEAR 2006

#### PRICE ON EARNINGS, BOOK VALUE AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs =	54
Model	148225.551	3	49408.517	F( 3, 49) =	12.93
Residual	187197.736	49	3820.36196	Prob > F =	0.0000
				R-squared =	0.4419
				Adj R-squared =	0.4077
				Root MSE =	61.809
Total	335423.287	52	6450.44783		

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
EPS	-.5698646	.4350647	-1.31	0.196	-1.44416 .3044305
dummy	-49.59162	23.76283	-2.09	0.042	-97.34482 -1.838419
BVS	.6729794	.1289587	5.22	0.000	.4138272 .9321315
_cons	74.53062	11.90432	6.26	0.000	50.608 98.45325

PRICE ON EARNINGS AND DUMMY FOR NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs	=	54
Model	44183.9794	2	22091.9897	F( 2, 50)	=	3.79
Residual	291239.308	50	5824.78615	Prob > F	=	0.0293
				R-squared	=	0.1317
				Adj R-squared	=	0.0970
				Root MSE	=	76.32
Total	335423.287	52	6450.44783			

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.5841504	.4626369	1.26	0.213	-.3450832	1.513384
dummy	-57.18103	29.28674	-1.95	0.056	-116.0052	1.643124
_cons	98.66791	13.54428	7.28	0.000	71.46341	125.8724

YEAR 2007

PRICE ON EARNINGS, BOOK VALUE AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs	=	62
Model	147685.362	3	49228.4541	F( 3, 56)	=	11.03
Residual	249862.842	56	4461.83646	Prob > F	=	0.0000
				R-squared	=	0.3715
				Adj R-squared	=	0.3378
				Root MSE	=	66.797
Total	397548.204	59	6738.10515			

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	-1.078393	.6799977	-1.59	0.118	-2.440593	.2838057
BVS	.9481572	.270686	3.50	0.001	.405908	1.490406
dummy	-64.05546	24.60077	-2.60	0.012	-113.3367	-14.7742
_cons	69.25919	11.72599	5.91	0.000	45.76921	92.74917

PRICE ON EARNINGS AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs	=	62
Model	92940.5791	2	46470.2895	F( 2, 57)	=	8.70
Residual	304607.625	57	5343.99342	Prob > F	=	0.0005
				R-squared	=	0.2338
				Adj R-squared	=	0.2069
				Root MSE	=	73.103
Total	397548.204	59	6738.10515			

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	1.036657	.3422524	3.03	0.004	.3513085	1.722006
dummy	-60.58474	26.90124	-2.25	0.028	-114.4535	-6.715945
_cons	89.51314	11.1642	8.02	0.000	67.1572	111.8691

**YEAR 2008**PRICE ON EARNINGS, BOOK VALUE AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs = 68		
Model	246998.698	3	82332.8993	F( 3, 63)	=	80.73
Residual	64252.2692	63	1019.87729	Prob > F	=	0.0000
				R-squared	=	0.7936
				Adj R-squared	=	0.7837
Total	311250.967	66	4715.92374	Root MSE	=	31.936

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.3019132	.1355774	2.23	0.030	.0309833	.572843
BVS	.6063237	.0390087	15.54	0.000	.5283711	.6842764
dummy	-15.2822	8.840277	-1.73	0.089	-32.94808	2.383685
_cons	21.11156	5.321943	3.97	0.000	10.4765	31.74661

PRICE ON EARNINGS AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs = 68		
Model	602.368683	2	301.184342	F( 2, 64)	=	0.06
Residual	310648.598	64	4853.88435	Prob > F	=	0.9399
				R-squared	=	0.0019
				Adj R-squared	=	-0.0293
Total	311250.967	66	4715.92374	Root MSE	=	69.67

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.0992595	.2944019	0.34	0.737	-.4888758	.6873949
dummy	.865519	19.15212	0.05	0.964	-37.39524	39.12627
_cons	45.38946	11.09893	4.09	0.000	23.21679	67.56213

**YEAR 2005-2008: POOLED DATA**PRICE ON EARNINGS, BOOK VALUE AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs = 227		
Model	671611.572	3	223870.524	F( 3, 219)	=	56.81
Residual	862938.554	219	3940.35869	Prob > F	=	0.0000
				R-squared	=	0.4377
				Adj R-squared	=	0.4300
Total	1534550.13	222	6912.38795	Root MSE	=	62.772

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.1163061	.1740152	0.67	0.505	-.2266526	.4592648
BVS	.5718044	.0512264	11.16	0.000	.4708446	.6727642
dummy	-38.15479	11.02397	-3.46	0.001	-59.88144	-16.42815
_cons	55.51453	5.522987	10.05	0.000	44.62952	66.39954



PRICE ON EARNINGS AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs = 227		
Model	180655.026	2	90327.5132	F( 2, 220) = 14.68		
Residual	1353895.1	220	6154.06863	Prob > F = 0.0000		
Total	1534550.13	222	6912.38795	R-squared = 0.1177		
				Adj R-squared = 0.1097		
				Root MSE = 78.448		

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EPS	.850826	.2013222	4.23	0.000	.4540591	1.247593
dummy	-22.85187	13.66994	-1.67	0.096	-49.79267	4.088929
_cons	77.64781	6.442027	12.05	0.000	64.95182	90.34379

# APPENDIX C: ANOVA FROM TABLE 6

## YEAR 2005-2007 (BEFORE THE CRISIS)

### PRICE ON EARNINGS, BOOK VALUE AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs =	159
Model	383863.477	3	127954.492	F( 3, 155) =	26.29
Residual	754472.988	155	4867.56766	Prob > F =	0.0000
				R-squared =	0.3372
				Adj R-squared =	0.3244
				Root MSE =	69.768
Total	1138336.46	158	7204.66117		

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
eps	-.2629219	.3301373	-0.80	0.427	-.9150709 .3892271
bvs	.6116173	.097976	6.24	0.000	.4180768 .8051577
dummy	-38.91847	16.4618	-2.36	0.019	-71.4369 -6.400038
_cons	69.23743	7.199618	9.62	0.000	55.01539 83.45946

### PRICE ON EARNINGS AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs =	159
Model	194178.726	2	97089.3628	F( 2, 156) =	16.04
Residual	944157.739	156	6052.2932	Prob > F =	0.0000
				R-squared =	0.1706
				Adj R-squared =	0.1599
				Root MSE =	77.796
Total	1138336.46	158	7204.66117		

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
eps	1.21315	.2569032	4.72	0.000	.705692 1.720607
dummy	-36.1791	18.34962	-1.97	0.050	-72.42487 .0666728
_cons	84.88384	7.525916	11.28	0.000	70.01799 99.74969

### PRICE ON BOOK VALUE

Source	SS	df	MS	Number of obs =	159
Model	355946.41	1	355946.41	F( 1, 157) =	71.43
Residual	782390.054	157	4983.37614	Prob > F =	0.0000
				R-squared =	0.3127
				Adj R-squared =	0.3083
				Root MSE =	70.593
Total	1138336.46	158	7204.66117		

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
bvs	.5783728	.0684349	8.45	0.000	.443201 .7135446
_cons	62.62391	6.705782	9.34	0.000	49.37872 75.8691

# **YEAR 2008 (DURING THE CRISIS)**

## PRICE ON EARNINGS, BOOK VALUE AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs	=	68
Model	245250.08	3	81750.0268	F( 3, 64)	=	78.54
Residual	66619.8539	64	1040.93522	Prob > F	=	0.0000
				R-squared	=	0.7864
				Adj R-squared	=	0.7764
Total	311869.934	67	4654.77514	Root MSE	=	32.264

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
eps	.2945718	.1368844	2.15	0.035	.0211138 .5680298
bvs	.6034627	.0393637	15.33	0.000	.5248248 .6821007
dummy	-16.54681	8.891662	-1.86	0.067	-34.30995 1.216322
_cons	22.44419	5.303496	4.23	0.000	11.84924 33.03914

## PRICE ON EARNINGS AND DUMMY NEGATIVE EARNINGS

Source	SS	df	MS	Number of obs	=	68
Model	606.551483	2	303.275742	F( 2, 65)	=	0.06
Residual	311263.383	65	4788.66743	Prob > F	=	0.9387
				R-squared	=	0.0019
				Adj R-squared	=	-0.0288
Total	311869.934	67	4654.77514	Root MSE	=	69.2

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
eps	.0960202	.2922784	0.33	0.744	-.4877001 .6797404
dummy	.1818199	18.92706	0.01	0.992	-37.61813 37.98177
_cons	46.01087	10.88684	4.23	0.000	24.26835 67.75338

## PRICE ON BOOK VALUE

Source	SS	df	MS	Number of obs	=	68
Model	231413.937	1	231413.937	F( 1, 66)	=	189.83
Residual	80455.9974	66	1219.03026	Prob > F	=	0.0000
				R-squared	=	0.7420
				Adj R-squared	=	0.7381
Total	311869.934	67	4654.77514	Root MSE	=	34.915

Price	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
bvs	.5753056	.0417552	13.78	0.000	.4919385 .6586726
_cons	16.69595	4.731843	3.53	0.001	7.248521 26.14338

## APPENDIX D: ANOVA FROM TABLE 7

### THE RESIDUAL STANDARD DEVIATION

#### **YEAR 2005**

```
. summarize error
```

Variable	Obs	Mean	Std. Dev.	Min	Max
error	43	3.73e-06	75.98365	-200.269	172.3556

#### **YEAR 2006**

```
. summarize error
```

Variable	Obs	Mean	Std. Dev.	Min	Max
error	54	5.16e-06	64.40281	-130.1576	191.2428

#### **YEAR 2007**

```
. summarize error
```

Variable	Obs	Mean	Std. Dev.	Min	Max
error	62	-4.49e-06	69.46834	-134.0642	201.1847

#### **YEAR 2008**

```
. summarize error
```

Variable	Obs	Mean	Std. Dev.	Min	Max
error	68	5.10e-06	32.37476	-60.13905	130.0842

### THE MEAN ABSLOUTE FITTED VALUES

#### **YEAR 2005**

```
. gen yhat=53.88036+1.181252* EPS+ .3541185* BVS
```

```
. gen error= Price- yhat
```

```
. summarize yhat
```

Variable	Obs	Mean	Std. Dev.	Min	Max
yhat	43	92.36535	57.6556	52.29305	364.7079

**YEAR 2006**

```
. gen yhat=66.24638-0.3816143* EPS+ .671497* BVS
```

```
. gen error= Price- yhat
```

```
. summarize yhat
```

Variable	Obs	Mean	Std. Dev.	Min	Max
yhat	54	97.84333	48.4546	66.30989	335.1929

**YEAR 2007**

```
. gen yhat=59.80685+ .9016849 * BVS-.8325998* EPS
```

```
. gen error= Price- yhat
```

```
. summarize yhat
```

Variable	Obs	Mean	Std. Dev.	Min	Max
yhat	62	91.32597	43.65306	59.72681	284.1177

**YEAR 2008**

```
. gen yhat=16.85964+ .3946509* EPS+ .5944744* BVS
```

```
. gen error= Price- yhat
```

```
. summarize yhat
```

Variable	Obs	Mean	Std. Dev.	Min	Max
yhat	68	45.80455	60.05539	10.42866	474.1153